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Risk Assessment and Fire Safety in Healthcare Premises

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DISSERTATION

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Abstract

Background: Fires are one of the most important threats that surround hospitals. These fires at the hospitals can result from fires in the trash, clothes, curtains, spark lights, defects in the medical equipment and electricity systems, etc. However, this risk can be mitigated by taking measures and steps to stop the initiation of fires and taking effective measures for the protection of people in the building.

Aim: The present research aims to evaluate the efficacy of risk assessments and their role in minimizing risks posed by fire in healthcare settings.

Methodology: This research study has been conducted through primary quantitative research. The research strategy employed in this study is the survey strategy. Strategic questions were used in the survey presented to participants selected through purposive sampling. The participants in this study were healthcare workers in the UK. The results obtained in the survey were then analyzed using SPSS.

Results: Most healthcare workers were aware of the fire safety norms in healthcare settings and the various associated components. The fire safety systems used in the hospitals are safety alarms with robust evacuation exits. The fire safety drill is one of the preferred ways to acquire fire safety training.

Conclusion: Fire Safety should be practiced as an essential component of patient safety in the healthcare sector in the UK. Various risk assessments are being practiced in the UK healthcare sector. Most of them are highly efficient and present a great way to minimize the risk of fire accidents and the loss of life and property caused by them.

Keywords: Fire Safety, Risk Assessment, Fire Protection, Fire Safety Alarms, Fire Regulations, UK Healthcare Sector

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CHAPTER 1: INTRODUCTION

1.1 Background

Fire is a serious threat and is responsible for causing major consequences in healthcare settings where the lives of many patients who can even be immobile are at risk (Omidvari et al., 2020). Hospitals are among the places where the fire incidents occur the most. These fires at the hospitals can result from fires in the trash, clothes, curtains, spark lights, defects in the medical equipment and electricity systems, etc. (Health and Safety Executive, 2021). The evacuation systems may even be delayed as a result of diseased, disabled, aged and people who are on life support. The supply of gasses such as oxygen also poses a significant risk to the safety systems in hospitals and medical care centers. This risk of fires can increase as a result of people's careless attitudes and behaviors, lack of education and training related to fire safety, and poor fire safety management within buildings, healthcare workers must get robust training in the field of fire safety so that the number one risk can be identified and the correct time and mitigated (Hassanain et. al., 2022).

Fire safety refers to the measures, precautions, and guidelines that are followed to reduce the risk of fire accidents and make sure the premises are safe for the people and property in case a fire occurs (Shokouhi et. al., 2019). In the year 2022-23, approximately 577, 147 fires were documented by the NHS which is a major increase of 18% from the past year’s fire incidents (Government of UK, 2024). In March 2023, there were 622,173 fire incidents which is again an increase of 7.8% (Fire Industry Association, 2024). The majority of these fire accidents were caused by secondary fires and some were caused by outdoor primary fires caused by hot dry summers.

The number of fatalities caused due to these fire accidents was 259 in March 2023 and 273 in 2022 (Government of UK, 2023). The fire accidents were at the highest number in the year 2004 in England but since then there has been a major decline. However, in 2019, the number of fire accidents is again rising. Then in the years 2020 and 2021, the number of fire incidents was reduced due to the restrictions due to Covid 19. However, this number has increased and has been on the rise since then. In the UK, fire accidents are broadly categorized into 3 categories, Primary Fires, Secondary Fires, and Chimney fires. Primary Fires are those that meet at least one of the following defining criteria - should have occurred in a building, a vehicle or any of an outdoor structure should have been involved in the accident, must have involved serious fatalities, casualties, and an enormous rescue (Kodur, et al., 2020). These fires cause serious damage to the people and property. Secondary fires are usually less fatal than primary fires as they do not cause damage to people and property (Ibrahim, 2020). Chimney fires are mostly caused in industrial buildings or sometimes in industrial buildings where the flame is still contained or trapped in the chimney structure (Shi, et al., 2020).

To reduce the events of fire at hospitals and other healthcare systems, four principles are used. Firstly, the focus should be on the safety of the lives of the people in the environment, and ensuring their safety is the foremost responsibility (Kelly, et al., 2021). This could be done through evacuation of the premises, notifying the essential services for fire safety, and extinguishing the fire. Secondly, notifying other people should be the priority through robust alarms or intercom systems (Ebekozien, et al., 2021). All healthcare workers should be provided training in using a fire extinguisher and it should be done when the whole premises has been evacuated. Lastly, all the people should be moved to safe places and ensure that all the members know the plan for evacuation and the routes of the whole place (Bahrami, et al., 2020).

However, the proper management of fire accidents can be made even more robust and efficient when people are aware of the risk assessments for fire safety as attached in appendices. The process of risk assessment for fire safety involves a series of steps to evaluation, inspection, and investigation of the whole premises of the hospital or the medical organization for any loopholes or potential hazards that could lead to fires (Figure 1) (Salazar, et al., 2021). Taking measures and steps to stop the initiation of fires and taking effective measures for the protection of people in the building. It includes the evaluation of the harm potential of the fire which can occur or occurred already (Cvetković, et al., 2022). Harm potential is the final consequence of the fire which could lead to damage to life and property. Hence, an early and effective judgment on the potential outcomes of the fire can lead to the lessening of the severity of the situation and the potential harm to the people and property.

Not only this, there are other advantages of having a robust risk assessment for healthcare settings. Development of a robust risk assessment plan provides the opportunity to identify the areas that could lead to possible fatalities and casualties, areas that could lead to fire such as electricity issues, and evaluate the various measures for the prevention for their efficacy so that they do not fail at the crucial moment, developing plans for emergency response specific to the needs of difference patients to the staff members (Sanni-Anibire, et al., 2020). By placing effective risk assessments in place healthcare organizations can reduce the risk of fire, and loss of life and property. They can also reduce the negative impact on patients and staff by reducing the chances of injuries, the safety of important medical equipment can be ensured, and robust care can be provided without any problems (Askaripoor, et al., 2020). Lastly, providing fire management training to the staff through mock fire drills can make them self-reliant and reduce their dependence on fire safety specialists which can turn out to be more effective for the

patients, their families, and the staff (Yan, and Wang, 2021). Hence, this study was found to be useful in setting the base for Risk Assessment and Fire Safety practices in Healthcare Premises.

1.2 Identification of research problem

Various problems occur while conducting the assessment of the risks of fire safety in hospitals. These include a proper evaluation of the potential fire hazards, susceptibilities, and measures of fire safety in the hospitals. To carry out this process, robust identification of the fire hazards, and the risk associated with them has to be evaluated through processes such as hazard identification and risk assessment (HIRA), and fire safety inspections, with fire risk assessment software. Fire safety inspections and tests are important for the identification of loopholes in safety protocols and for recommending alterations and changes needed to the fire detection and suppression systems. The fire risk assessment is also required to document and assess any changes made in the hospital infrastructure such as new equipment, construction of new rooms, etc. Through this procedure, information about the various sources of potential fires could be detected and mitigated which is necessary for the generation of a safer atmosphere for the patients, staff, and visitors. Hence, this study can address the problem of the least studies conducted on this topic and examine the Risk Assessment and Fire Safety practices in Healthcare Premises.

1.3 Research Aim

The present research aims to evaluate the efficacy of risk assessments and their role in minimizing risks posed by fire in healthcare settings. In addition, the evaluation of measures of fire safety and precautions will also be assessed in hospitals in the UK.

1.4 Research Objectives

For the fulfillment of the aims of the study, research objectives have been set up which guide the transition throughout the whole study and provide ideas for conducting the study. These research objectives are:

1. To ensure the safety and welfare of patients, staff, and visitors through the identification and mitigation of potential hazards.
2. To identify the risks, evaluate the risk levels, implement controls to mitigate risks, record findings, and update of assessment for current safety.
3. To prevent fires and ensure that, in the event of a fire, the risk to individuals is minimized.
4. To recommend the framework for effective safety measures against fire in the health sectors.

1.5 Research Questions

These research objectives could be addressed by the right set of research questions which will act as the primary drivers of the study. The research questions are:

1. What measures have been taken to ensure the safety and welfare of the patients?
2. How do we evaluate the risk levels associated with fire safety?
3. What precautionary measures have been taken to minimize the risk?
4. What are the challenges faced by hospitals in the United Kingdom during fire accidents?

1.6 Hypothesis

The hypothesis involved in the study which will be proved by the quantitative analysis conducted in this study are:

H11: Through the identification and mitigation of potential hazards, the safety and welfare of patients are substantially ensured.

H01: Through identification and mitigation of potential hazards, the safety and welfare of patients are not substantially ensured.

H12: Identifying, evaluating, and implementing risk controls are prevalent in health care.

H02: Identifying, evaluating, and implementing risk controls are not prevalent in health care.

H13: The risk to individuals is significantly minimized by preventing the occurrence of fire.

H03: The risk to individuals is not significantly minimized by preventing the occurrence of fire

1.7 Research Rationale

Maintenance of the safety and welfare of healthcare workers, patients and visitors is most important for successfully evacuating the people during the event of a fire accident in hospitals. This is due to the responsibilities of healthcare workers, the vulnerable condition of the patients, and the dependence of the visitors on the healthcare staff for their safety. Hospital has a complex infrastructure for evacuation due to the large amount of high-risk areas, medical equipment and flammable and hazardous substances used. Therefore, robust risk assessment procedures become highly important to lessen these risks. The study aims to assess the efficiency of these risk assessments in decreasing the possibility of fires in hospitals, especially in the UK. This study is set at a specific time duration and is extremely important due to the following reasons.

The risk assessment and protocol for fire safety are essential because hospitals are functional 24 hours with numerous people going in and out of the premises throughout the day. There are many patients in the hospital who are critically ill or injured, many are on supporting devices. In this case, the risk levels and fire hazards should be identified and for this reason it is very important that people understand the intricacies of fire risk assessments. This study aims to provide various components of fire risk assessments and it will be divided into the following. First, the importance of safety and welfare of patients, hospital staff and visitors will be understood. Secondly the risk factors as potential hazards which cause fires in hospitals will be explained along with the preventive measures which are taken at the hospitals in the UK. Thirdly, the risk levels and risk assessments will be critically evaluated. Lastly, the challenges faced by the people in the hospitals during fire accidents will be illustrated.

The research aim and objectives of the present study are specially designed to systematically address all these different components of risk assessments. With a thorough understanding of these compensations the patients and visitors can have a detailed idea of the potential risk factors of fires, risk levels associated. measures for prevention and control and practices necessary to maintain safety in hospitals. This study will play an instrumental role in identification and evaluation of risks with the proper implementation of control measures, documenting the findings and will provide an overview of the current safety standards. This will aid in designing effective fire safety frameworks in healthcare settings.

By providing and investigating answers for the research question which will drive the whole study and provide direction, this study will provide a thorough explanation of the management of fire safety.

The findings of the study aim to inform and influence policy decisions, provide necessary guidance in the development of a regulatory framework, and design protocols for fire safety in healthcare. This study will be specifically based in the UK with some reference to global standards. This study will also address the challenges faced by various stakeholders in the hospitals during fire accidents. By providing evidence of these challenges, the study will provide valuable recommendations and effective solutions that can be adopted by healthcare institutions for enhancing their current fire safety frameworks.

To conclude, this research study will provide a critical understanding of fire safety in healthcare settings. The study will provide various actionable measures to reduce the incidents of ire in hospitals ensuring the safety and well-being of patients, hospital staff, and visitors. The findings of this study will play an instrumental role in protocol and guidelines for fire safety and the development of better and safer healthcare institutions.

CHAPTER 2: LITERATURE REVIEW

2.1 Background of the chapter

This chapter provides a review of the research performed on the topic 'Risk Assessment and Fire Safety in Healthcare'. A Literature review is the process of identifying the knowledge already developed and existing on a given topic (Snyder, 2019). This is done based on the research objectives identified in the study and themes are identified on which the literature review is based. In addition, a review of the literature is also conducted to identify the components of research that are available and identify the gaps within the literature (Kraus, et al., 2022). It provides the already existing context of the research topic and further explains the research problems. This research review will mainly involve articles from global and UK perspectives.

2.2 Safety and Welfare of Patients, Staff, and Visitors during Emergency Situations

The safety and welfare of the humankind is of paramount importance during emergencies such as fire accidents. A fire accident is considered a disaster as it is sudden and unexpected and requires the physical and mental abilities of a person (Liu, et al., 2023). It destroys the economic and social well-being by causing economic losses and even results in fatalities. Fires in Healthcare settings are especially destructive because they not only cause risks to mankind but the media infrastructure, equipment, and other resources are at the risk of destruction (Moslehi, et al., 2024). For this reason for the safety and well-being of the patients, visitors, and staff, disaster preparedness is crucial. It is important to safeguard the people and other amenities in the hospital during critical times such as fires or any natural disasters (Khirekar, et al., 2023). The process of ensuring the

safety and welfare of the patients, visitors, and staff during an emergency such as a fire consists of various steps. These involved evacuating the patients, visitors as well and staff members, establishing a robust system of communication so that everyone could be informed about the fire outbreak, the developing safety measures such as fire alarms, fire extinguishers, sprinklers, and use of material that resists fires (Atwan, 2024). In addition to that, taking into consideration the number of casualties and fatalities that are caused due to fire accidents, medical facilities should always be present. Training of the healthcare staff with simulation and drills should take place so that they can get accustomed to the fire situation and behave accordingly (Balut, et al., 2022). Studies have illustrated that visitors should be managed systematically so that informing and educating them is easier (Che Huei, et al., 2020). The most important people during this time were the hospital staff who could take control of the situation and evacuate patients and visitors to improve their safety (Rahouti, et al., 2020). The hospital staff should be provided training in patient and self-evaluation during emergencies such as fire accidents.

The safety and welfare of the patients, staff, and visitors are of immense importance because it consists of the primary motive of saving as many lives as possible and preventing serious injuries. The hospital is built primarily on the trust of the people so proper tools and protocols for the management of emergencies should be present so that this trust can be maintained and care can be continuously provided (World Health Organization, 2021). Moreover, resuming the emergency care services is important so that care of the patients is not ceased (Péculo- Carrasco, et al., 2020). Lastly, improper management of emergencies such as fires can lead to legal consequences and the reputation of the hospital could be damaged (Agus Salim, et al., 2023).

Various barriers play a part in ensuring the safety and welfare of patients, visitors, and staff during such situations. For the healthcare staff, these factors are having a well-

defined hierarchy for commands, proper coordination among the members of the staff, resilience, presence of mind, and proper training of the staff for fire evacuation (Usoro, et al., 2023). For the patients and visitors, the age of the person. illness, any sort of disability (physical or mental) plays the most crucial role (Haghpanah, et al., 2021). Other than these, there are budget limitations that do not allow the hospital to invest in advanced safety equipment, robust training of the staff, and efficient safety systems (Jaafar, et al. 2023). The lack of an optimum quantity of staff in a hospital leads to the existing staff performing poorly during emergencies due to fatigue and burnout (Bruria, et al., 2022). The lack of effective training, simulation, and emergency drills leads to a lack of preparedness in the staff (Tsolakidis, and Vasiliki Diamantidou, 2022). In this situation, the staff is not ready for the emergency response. Many hospital buildings are complex and this makes it difficult for the staff to evacuate patients promptly. The lack of state-of-the-art communication equipment is essential in the hospital so that all the emergency information can be provided to everyone in the building (Alhammadi, et al., 2024). The policies and guidelines set up for the fire management may not be accepted by everyone equally which leads to resistance and delays. There might not be effective protocols or systems for the management and tracking of the visitors, especially in public hospitals which can lead to a higher number of casualties in case of fires as the total number of people in the building is not documented (Filip et al., 2022). Since the hospital has limited resources, maintaining all the protocols and compliance for emergency management cannot be feasible (Rawlings et al., 2020). Emergency response requires optimal levels of technology for purposes such as tracking the total number of people in the hospital, communication, and evacuating disabled patients and injured people but failure in utilizing technology during emergencies such as fire accidents can be proved to be fatal (Damaševičius, et al., 2023). Failure to properly communicate and seek help from

external emergency agencies such as fire departments and police can delay the whole process of management of fires which can result in higher losses of life and property (Fischer, et al., 2019).

2.3 Risk Factors that lead to Fire Accidents in Healthcare and the Prevention Measures taken for their Mitigation

Identifying the various factors that are responsible for causing fire accidents in healthcare settings is important to address the mortality, and morbidity associated with fire accidents and the economic losses that the individuals and organizations bear (Shokouhi, et al., 2019). Human errors and risky behaviors are the most important risk factors that lead to fire accidents in healthcare settings (Ahamed, and Mariappan, 2023). Other risk factors include the flammables that are used in medicine such as oxygen cylinders (Yousofnejad, et al., 2023). There are many incidents of oxygen-related fire accidents all over the world.

The prevention measures include having strict protocols for safety for both normal and staff involved in surgeries. Hospitals should have a risk assessment and risk mitigation protocols set up for the risk of fire associated with gasses such as oxygen (World Health Organisation, 2021). During COVID-19, the incidents of fires in hospitals were at risk due to the large amount of oxygen cylinders being used in the treatment of COVID-19 patients (Paliwal, et al., 2022). This is since oxygen can react with the majority of the substances such as oil, grease, and other ethanol-based and organic chemicals used in medical settings, and in an oxygen-enriched atmosphere, the fire burns at a larger volume (Wood, et al., 2021). Any leaking valve can increase the levels of oxygen to dangerous levels and a level of greater than 24% can create a fire hazard (Wood, et al., 2021).

Other than these chemical hazards, many electrical hazards in the hospital are responsible for causing fire accidents. These are overloading of electrical points, a continuous power

supply that is uninterrupted and improper, acid in batteries, thermo-coal lined false ceilings in hospitals, lack of efficient and safe wiring, and overheating of wires and circuits in hospitals lead to fire accidents (Sharma, et al., 2020). Other than these hazards, fires in the hospital kitchen also pose a significant risk of fire accidents (Juyal, et al., 2023). The equipment in the kitchen malfunctions due to the higher electrical load of the hospital which causes them to catch fire or blast.

To maintain the antiseptic conditions in the hospital premises, they are repeatedly cleaned with alcohol-based cleansers. The use of such highly flammable cleansers especially near the sources of fire accidents such as faulty medical equipment, electrical wirings, and oxygen cylinders can result in fires (Altaie, et al., 2023). Medical equipment such as anesthesia machines are also potential sources of fires as these produce oxygen so any combustion near these machines can cause severe accidents (Jayathunga-Mudiyanselage, and Park, 2020). Many hospitals make use of extension cords for using multiple medical equipment together. These extension cords can become overheated and thus pose a significant threat (Saidi, et al., 2021). Lack of knowledge of using fire safety equipment is not a threat but can increase fire catastrophe. Furthermore, the materials that catch fire easily such as paper, and cloth should be stored in places that are fire-resistant so that they do not cause much damage. Studies have shown that the people at the highest risk are patients with major injuries and disabilities and older persons (Ahn, et al., 2022). Other than these, the visitors are also at risk since they do not have adequate knowledge of dealing with fire accidents. The staff is also at risk if they are under pressure and burnt out. The medical equipment and other important resources are at risk of getting damaged in the fire accidents.

For the mitigation of fire hazards, many different prevention measures are taken. For the robust identification of all the potential sources of fire, a comprehensive fire assessment

is done (Yuen, et al., 2021). The aim of the assessment is not only to evaluate possible risks but also to implement effective safety measures so that fire incidents can be prevented. All the staff of the hospital from doctors to the janitors working both in day and night shifts should be provided robust and comprehensive training to mitigate any potential fire accidents (Fire Safety Policy, 2017). Simulation and mock drills take place regularly so that all the staff can develop emergency behaviors and plan of action when and if the actual situation arises (Agus Salim, et al., 2023). The hospital premises are equipped with fire alarms that detect signs of possible danger such as heat or smoke (Muhamad Salleh, et al., 2020). These alarms can also alert the people and notify them to evacuate the premises in case of fires. Proper routes of emergency exits are created in the hospitals to be used in case of emergencies such as fire accidents (Abir, et al., 2022). These are well-marked and obstruction-free passages that can guide people to the nearest route of exit. The staff should be made aware of all such routes so they can be accessed when the situation arises. Various other fire equipment such as fire doors and smoke curtains are also used in hospitals as these provide necessary protection firm fires and smoke curtains don't allow the smoke to be spread all over the place and provide extra time for evacuation (Chen, et al., 2022). The flammable materials such as those containing alcohol and glasses such as oxygen are kept in well-developed storage areas that do not come in contact with any sources of fire (Ruff, et al., 2023). Strict guidelines and protocols are implemented in many hospitals in the UK and globally for their proper storage and use. Many hospitals also keep an extra backup for electricity and batteries so that the life-saving equipment can continue to work in case of emergencies and provision of care can be provided continuously (Lloyd, 2023). Fire extinguishers are the basic fire safety equipment that are present in all the places that have potential fire hazards (Cvetković, et al. 2022).

2.4 Risk Levels in Risk Assessment for Fire Safety

Fire assessments throughout the world divide fire accidents into various levels of risks on the fatalities and the likelihood of fire occurrence. There are mainly 3 levels of fire risks. The first level is the low-level risk characterized by the minimum chances of fire accidents. In this area, the fire safety protocols and guidelines are most strictly maintained and the amount of combustible material is also minimal (Rzaij, and Al-Obaidi, 2022). The second level is the Medium risk which is characterized by a slightly higher likelihood of fire accidents due to the presence of flammable substances (Liu, et al., 2023). These also include general departments in the hospitals such as laboratories, general wards, and kitchens where activities that take place daily are responsible for posing fire risks. The third level is High Risk which is characterized by areas where the probability of fire outbursts is high due to the presence of flammable substances, chemicals such as oxygen, and hefty medical instruments (Fire Risk UK, 2023). These are included in the high-risk level ICUs due to the presence of oxygen cylinders and life support equipment which require regular sanitization, operating rooms due to the presence of oxygen cylinders, and storage areas where flammable substances and oxygen cylinders are stored (Wróblewski, et al., 2022). These risk levels are important; they identify and prioritize regions where there is a need for advanced safety. regular evaluations and emergency preparedness.

Likelihood		Very Likely	Likely	Unlikely	Highly Unlikely
Consequences	Fatality	High	High	High	Medium
	Major Injuries	High	High	Medium	Medium
	Minor Injuries	High	Medium	Medium	Low
	Negligible Injuries	Medium	Medium	Low	Low

Figure 2: Risk levels in fire safety

Source: (The Scottish Government, 2020)

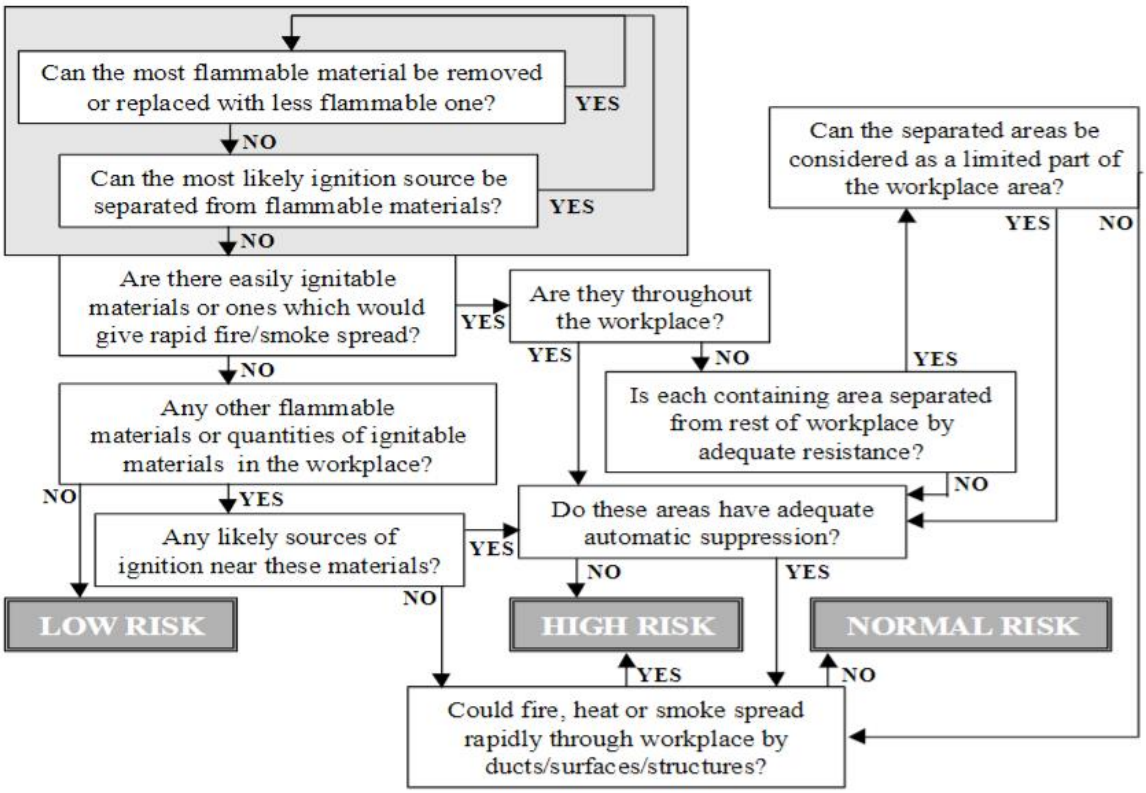
These risk levels are essential for many reasons. These risk levels protect the lives of people by identifying areas of risk and potential hazards which is necessary to prevent accidents and casualties (Askaripoor, et al., 2020). These risk levels fall under legal regulations for fire safety and must be adhered to comply with the governmental fire protection guidelines. These risk levels also make sure that the hospital continues to provide services and that hospital operations are not disrupted (Hosseini, and Maghrebi, 2021). Lastly, the risk levels ensure that the resources of the hospital such as medical equipment and other infrastructure are not lost and the hospital maintains full functioning.

These risk levels operate in a system where they identify the areas where the fire hazards are maximum present and there are maximum chances of fire outburst (Al-Hajj, et al., 2020). Then they assess the risk and possibilities of fire accidents as well as the consequences it will have on the life, property, and resources of the hospitals. Further, they implement measures to prevent any fire accidents and potential casualties such as proper storage of flammable substances, regulation of hospital function, and staff training (Menzemer, et al., 2023). In the event of any infrastructure change in the hospital, these risk levels also change which is essential to assess the potential dangers and threats to the safety of the people and resources.

These risk levels are evaluated for their efficiency in determining the possible risk factors and potential hazards that cause fire accidents. Firstly, they are evaluated for their thoroughness and comprehensive assessment of the risks and the ability to mitigate those risks (Shen, et al., 2023), Secondly, the risk levels criteria are regularly updated so that any possible evolution in the risk and fire hazards are not missed (Grimaz, et al., 2021). Thirdly, Risk levels and assessment ensure that proper training is being provided to the staff about any possible risks and measures of prevention of fire accidents to increase the efficiency of the risk assessments (Danzi, et al., 2021).

The strengths of these risk levels in the mitigation of fire hazards include the proactive prevention of fire accidents as the risk levels and assessments determine the hazards and possibility of fire before the actual accidents take place (Rout, and Sikdar, 2017). These risk levels adhere to the compliance set up for the regulation of fire safety and management (Bird, 2023). Lastly, these risk levels can be customized to match the requirements and conditions of the hospitals in which they are being implemented (Government of UK, 2023). The limitations of these risk levels include the high amount of financial resources with longer time and effort for their implementation (Rahardjo, and Prihanton, 2020). These risk levels are calculated by professionals since the involvement of technology is very limited. This increases the chances of human errors as the results depend on the expertise, specialization, and efficiency of these people (Shokouhi, et al., 2019). These risk levels require frequent updating as the conditions in the hospital are constantly changing. The risk levels are determined during risk assessment. An example of the risk level assessment is given below.

Figure 3: Assessment of Risk Level in Fire Safety in the UK



Source: (Fire safety risk assessment, 2022)

Various legal and ethical considerations are applied to these risk levels. These are adherence to the fire safety regulations such as Regulatory Reform Fire Safety Order 2005 and legal issues when fire accidents occur (London-fire, Government of UK, 2023). The ethical considerations include the duty of care with an obligation to provide the utmost care to the patients (Haddad and Geiger, 2023). The fire hazards and any possible risks are reported with utmost transparency. Lastly, preventive measures and evacuation from fire accidents should be equitable and should not discriminate against people on any basis.

2.5 Process of Fire Risk Assessment

The process of Fire risk assessment consists of many different steps. These can be classified as the identification of hazards, identification of the people and property at risk due to the fire hazards, removal, and reduction of risks, categorizing the risk according to

the level of fatalities it can cause, and assigning them categories, deciding if there are adequate safety measures, deciding if the level of residual risk is at the tolerable level and lastly, ensuring that the plan of action is adequate and robust through proper review (Fire safety risk assessment, 2022).

Figure 4: Fire Risk Assessment Procedure

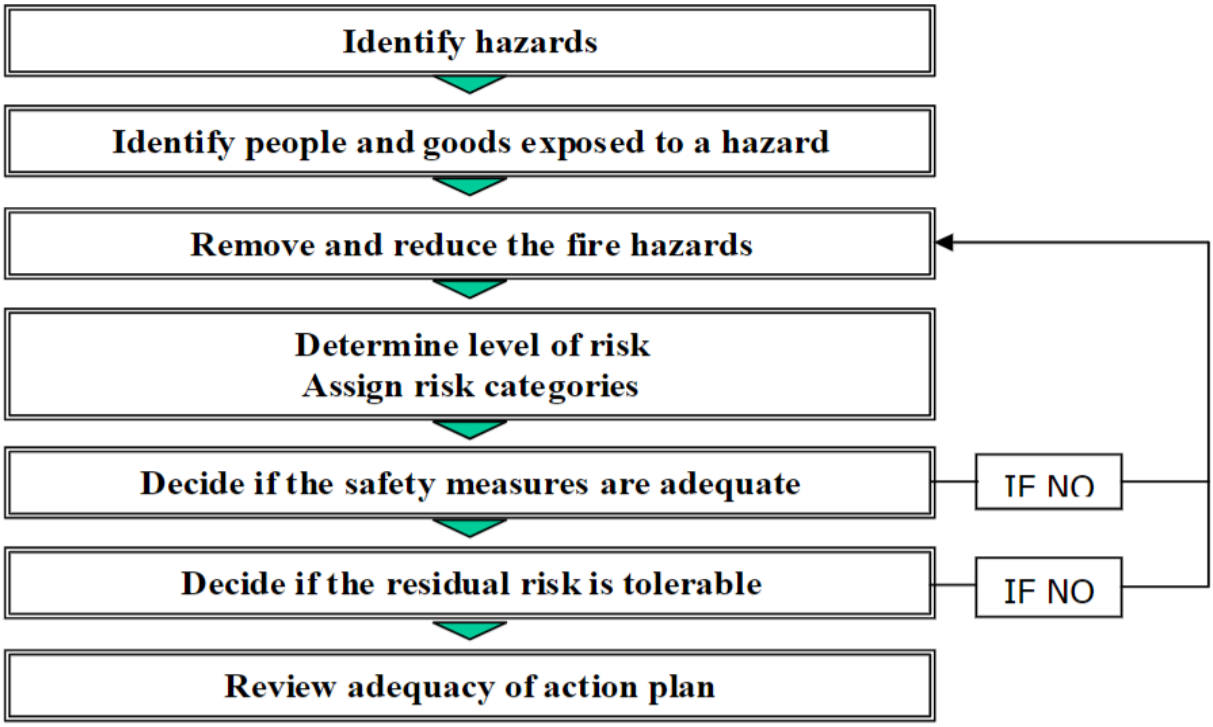


Figure 1: Risk assessment procedure

Source: (Fire safety risk assessment, 2022)

The most common methods which are used in the fire safety risk assessments are the specific methods according to each country along with some standardized methods such as Gretener Method, Meseri, FRAME, Fire Safety Concepts Tree, Dow Index etc (Brzezińska, and Bryant, 2021). The identification of hazards can be done systematically with the understanding of the materials and equipment that are identified as hazards. Moreover, the knowledge of their functionalities and of the methodologies in which they

are used is essential to understand the mechanisms behind their contribution to the fire. The proper understanding of the nature of the substances such as flammable, combustible etc and possible ignition of fire can make it possible to remove such substances from locations where there are maximum possibilities of fatalities (Muhamad et al., 2020). The identification of the people who are at risk at different locations in the hospital is of prime concern. The people at the most risk are critically ill and disabled patients and visitors because of their limited mobility and lack of knowledge of emergency exit points. The points to consider while identifying the number of people who may be at risk due to fire accidents are where the accommodation is provided to the most at risk patients, location in the hospitals where the maximum number of people might be present, the lack of knowledge of layout of the hospitals and emergency exit doors, staff working at location which do not have an easier escape route, the people who may be working at higher floors might find it difficult to evacuate the building at the correct time (D'Orazio et al., 2020). Next is the decision regarding the identified fire hazards. Each of those hazards need to be tackled in the correct manner such as reduction in their number, replacement by a relatively safer material or equipment, separated from the rest of the area, protected from potential sources of ignition, repaired or cleaned and the people who might be using those material and substances need to be educated and made aware of the potential consequences of using the hazardous material (Rahouti et al. 2020). To understand the extent of risks of different materials and the level of acceptance in the UK , different legislations which govern fire safety should be consulted. These include the national laws and regulations, the international standards which define all the hazards and risk levels and the principles of fire protection which the organization has created or adopted. The determination of the level of risk is another crucial step to avoid any major fatalities due to the fire accident. For the effective management of the risk hazards at different levels,

measures of prevention are set which must be critically evaluated during the analysis of risks to determine their level of credibility, reliability and validity to prevent the fire accidents (Rahardjo, and Prihanton, 2020). The decision regarding the tolerability of the risks is another major issue to deal with. The acceptance of the identified risks depends on this step. The risks identified are considered tolerable if the specifics rules of the legislation of fire safety regulations are met. The specific rules are the load bearing capacity of the buildings of the limited period of time, the extent of generation of fire and smoke in the building, the extent of spread of fire in the neighboring areas, the possibility of escape of the occupants of the areas where there indirect risks, the safety of the team which has to rescue the people (Steen-Hansen et al., 2021). The improvements through the risk assessment process can be done by decreasing the time of evacuation and route length of the passage to the nearest emergency exit to all the areas within the building, the incorporation of additional routes for escape, the installation of more number of fire alarms, the incorporation of more number of fire safety signs, and sprinkler systems in more areas of the buildings (Smith et al., 2020). In addition to these, robust training for fire safety has to be done for the healthcare workers, and more people with the specific purpose of fire safety should be recruited by the healthcare organizations (Sadeghi et al., 2022). Lastly, the action plan for the implementation of fire safety should be reviewed thoroughly in diverse situations so that maximum efficacy can be achieved and the hazards can be kept under control (Ding et al., 2020).

2.6 Challenges faced by the hospital during fire accidents

Many studies have provided evidence of the challenges faced by various stakeholders in case of fire accidents in healthcare settings especially in tertiary medical settings. The challenges faced during fire accidents can be leveraged to improve the current systems of

fire safety in the hospital. The patients face the maximum difficulties and challenges during the evacuation process because of their health conditions. Studies have depicted that disabled critically injured or ill patients are at the highest risk of casualties during fire accidents (James, et al., 2020). The patients facing cognitive or psychological illnesses often go into a state of panic or anxiety making the evacuation process extremely difficult (Piotrowski, et al., 2021). Many patients can be life-saving devices or with heavy dependence on medical equipment for their survival, which becomes critical because their evacuation along with the medical equipment is extremely difficult (NHS England, 2020). Saving such critical patients is the biggest challenge that medical professionals and fire rescue staff face during evacuation at the hospital. The responsibility of the safe evacuation of all patients falls at the end of the healthcare professionals as they are bound by their ethics and duty of care (Gray, et al., 2020). They often prioritize evacuating the patients first which leads to their lives in danger and risk their safety. The senior healthcare professionals have to make decisions under very high pressure and without complete knowledge of the condition of the hospital especially if the communication systems of the hospital are damaged or not well developed. Another critical challenge faced by the healthcare professional is continuing the care of the patients especially those who are critical (DeVita, et al., 2022). They are bound by the herculean task of evacuating critical patients along with the necessary medical equipment so that care can be provided without delays and the lives of the patients are not at risk (Thomas et al., 2020).

Another group of stakeholders who face major challenges during fire accidents in a tertiary healthcare setting such as a hospital is hospital administrators. All the communication and coordination tasks fall under their premises. Ensuring that the emergency response team is well coordinated with different departments and healthcare workers evacuating the patients they have to make sure that no one is left behind (Azarmi,

et al., 2022). The administrators also have to make sure that there are sufficient resources available during the fire accidents for the robust process of evacuation such as evacuation tools and equipment for firefighters (Goniewicz, et al., 2020). Administrators also have the challenge of ensuring that all the protocols and safety guidelines are being followed, the evacuation of the proper in the hospital including the patients and healthcare staff and there are sufficient tools for evacuation (Gola, et al., 2020). Lastly, they have to perform the analysis and documentation of the whole incident including where all the hazards and risk levels were present, the safety protocol followed, and number of people evacuated, the number of casualties, etc (Ebekozien, et al., 2022). Visitors also face many challenges during fire accidents in hospitals. The biggest challenge faced by the visitors is a lack of knowledge of the safety routes, safety protocols, and layout of the hospital due to which they have many difficulties, confusion, and delays in the whole evacuation process (Kirik, et al., 2022). The psychological distress, panic, trauma, and tension of the safety of their family faced by the people render them unable to follow the instructions given to them (Bayou, and Wong, 2021). The burden of healthcare professionals increases due to the dependence on evacuation of visitors (Yazdani and Haghani, 2023). Understanding the challenges faced by all the stakeholders during fire accidents is important for establishing preventive measures for the safety of hospital staff, visitors, patients, and essential resources such as life support equipment.

2.7 The legislation in the UK related to Fire Safety and Risk assessments

For the safety of the citizens, the United Kingdom has several legislations and policies that cater to the safety of people in different sectors including the healthcare sector. These laws include The Fire Safety Act 2021 which is the latest act made by the British parliament. It was enacted on May 16, 2022, and it amended an older regulation called

Regulatory Reform (Fire Safety) Order 2005 (FSO). It is considered as the major legislation for the fire safety of buildings in England and Wales in the UK. The Fire Safety Act 2021 applies to buildings with two or more domestic premises and includes fire risk assessments of the structure of the buildings, the outer walls, and entrance doors. Another major fire safety legislation in the UK is the Fire Safety (England) Regulations 2022 which was formulated after extensive inquiry into fire hazards. It was implemented through the recommendations of the Grenfell Tower Inquiry Phase 1 report. Under this legislation, some people are chosen as the Responsible Persons who are refined under Article 3 of the Fire Safety Order. These people are provided additional duties of safety and are expected to increase the coordination and collaboration within the building so that in times of emergency and to ensure adequate risk assessments are being implemented regularly. All the chosen Responsible Persons are required to carry out a comprehensive fire risk assessment of the building in which they are in charge. This rules out the earlier requirement of documenting only the significant results of the fire safety risk assessment. Lastly, they are required to review and update these assessments in a timely manner.

The Building Safety Act 2022 also strongly recommends the need for fire safety risk assessments as per the recommendation of the Grenfell Tower Inquiry recommendations. According to the legislation, it is essential for all the residents to be informed about the risks of fire and associated measures of safety. It is mostly applicable in the case of high-rise buildings with multiple occupancy options which are required to have better standards of safety. This act identifies a person as an Accountable person who is responsible for the daily management of the building and the associated risks of fire along with the duty to comply with fire safety. They are also required to educate the residents of the building about fire safety and share all the necessary information with the residents.

2.8 The Technologies in the area of Fire Safety Risk Assessments

The technological advancements have led to innovation in the field of fire safety. Novel technologies and advanced systems have provided significant fire prevention strategies for the prevention, and detection of fires in healthcare settings. Novel and advanced technological devices such as advanced alarm systems and detection systems. The conventional fire alarms and detection system are free on the sensors. However, there are many advanced systems that function through Internet of Things technology which have a complex network of sensors that provide a holistic and robust detection of fire hazards and a timely efficient response to those hazards (Chen et al., 2021). These advanced systems can detect fires with higher efficacy and also provide the exact location of the fire. This allows the people to evacuate and the responder team can respond in an efficient manner. The Internet of Things-enabled alarms are not just able to alert the residents and the people at the fire location but can notify many stakeholders at the same time so that proper steps for fire mitigation are taken quickly. These stakeholders include all the residents of the buildings, the managers and chosen responsible persons, and the emergency response team. This prompt response and action make sure that everyone is informed at the correct time and action is taken promptly with the minimum damage. Another significant achievement of technology in fire risk assessment is advanced monitoring and fire management. Real-time data was provided to all the stakeholders which has increased the efficiency of fire safety management and led to better outcomes for the healthcare sector. Many of these monitoring and management technologies also provide mobile applications that are easier to use, provide any time operations facility and solve issues promptly. The easy access to risk assessments with the help of technology also ensures faster adjustments and upgradation of safety protocols. All the data is stored in these mobile applications which also allow the stakeholders to make

better and informed decisions. Many of the buildings are not equipped with building Automation Systems which are for improving the fire safety functionalities. The Internet of Technology is also integrated with this which enhances the management of fire hazards in the buildings especially in healthcare settings (Shaharuddin et al., 20230. These systems coordinate the response to fire accidents by providing integration of the fire safety systems with the Building Automation Systems which activates mechanisms such as HVAC shutdown which improves the evacuation capabilities of the buildings and immediately decreases the access to the areas affected by the fire (Lv et al., 2022). This Integrated system of Building Automation systems and the Internet of Things also makes use of predictive analysis. These technologies thoroughly review the fire hazards and through predictive analytics predict the possibility of fire in any area of a building (Omidvari et al., 2020). Moreover, this led to prior informing to the concerned stakeholders and better mitigation strategies could be generated. The Internet of Things also plays a role in the prevention of Fire. The IoT-enabled fire prevention devices provide innovative solutions to complex problems of fire detection using various environmental factors that also play a role in IoT-enabled fire detection. This acts as a principle behind these devices. Environmental factors such as quality of air, temperature, and humidity, can be detected and reviewed for potential fire risks (Ebekozien et al., 2021). For example, the detection of smoke or higher temperature in the environment as compared to the regular conditions may indicate the possibility of fire. IoT-enabled devices provide real-time alerts and notifications sent to stakeholders such as emergency responders who can promptly take action to mitigate the fire risk.

Predictive analytics also involves predictive modeling which uses traditional statistical methods to predict the possibility of fire before they occur (Jamarani et al., 2024). Many healthcare organizations, especially the NHS, have made use of predictive analytics to

prevent potential fire accidents. It also allows the formulation of prevention strategies. This utilizes the raw data and transforms it into actionable insights which can be used for various purposes such as making informed decisions and preventing future fire accidents to enhance the level of preparedness (Ma et al., 2021). This form of predictive technique functions by the collection and processing of raw data from various sources which could be used to predict the possibility of fires (Imran et al., 2021). These sources are weather, building materials, the occupancy of the building, and the history of fire accidents in the past. Taking into consideration all this different information, artificial intelligence and machine learning algorithms are applied to form correlations and predictions (Grari et al., 2022). For the proper utilization of predictive modeling, a continuous inflow of data is required. This necessitates the requirement of risk assessments.

Digital risk assessments are becoming increasingly popular for the real-time detection of fire hazards in healthcare settings. This technology makes use of predictive analytics and collects environmental data to firm patterns and trends which can be used to make predictions (Saponara et al., 2021). The digital systems contain enough data on the past fire systems including the material used in buildings, the fire hazards, and the layout of the buildings. These enable better prediction of possibilities and outcomes by the software. These programs have a high level of accuracy, reliability, and validity of their findings as compared to the conventional methods of prediction of fire accidents (Khan, et al. 2020). They are also quick, adaptable and have fewer possibilities of human error. This also decreases the time taken for the mitigation of the risk. Another benefit of these digital systems is the reduced costs and optimal use of an allocation of resources. The Digital system can function without human intervention, decreasing the requirements of human checks and inspections and decreasing the overall cost of labor (Syed et al., 2021). The issues that could become a grave danger are mitigated beforehand which reduces the

damage. The resources such as emergency responders and financial resources are strategically allocated to locations where they are needed the most. This decreases the wastage and deploys the resources to the high-risk areas which improves the efficiency of the process.

Lastly, the increase in the efficacy of fire risk assessment through digital systems ensures that the evacuation process is faster, and the risk of injury and fatalities is reduced (Huang et al., 2022). The primary responders and the responsible persons of individual buildings can make better decisions and respond to the situation more effectively. These systems improve the overall process of risk identification, assessment, and management with the help of features such as proper identification of risks, layout of buildings, and providing automated notifications to the stakeholders (Mehdi et al., 2024). There are various challenges that these technologies face. Challenges involving operational and technical capabilities. The primary operational challenge that these technologies face is the integration of various digital devices and technologies such as sensors, networks of communication, and data analytics software (Siddiqui et al., 2021). The system needs to have timely upgrades to reduce issues of compatibility. Technical expert professionals are required for the maintenance of these systems and troubleshooting the technical issues (Makisha, 2024). The uptime of the system needs to be maintained for the smooth functioning of the system, as downtime can degrade the safety. For the proper functioning of these systems, regular maintenance and updates are important which increase the workload and essential costs. The issue of privacy and confidentiality of intimation such as the layout of buildings is crucial. These data need to be protected as it can lead to unauthorized access into the building which can even result in thefts. The problems of regulatory compliance are also prominent. These digital systems need to maintain regulatory compliance at the local, national, and international levels. They also require

timely audits to make sure they do not face any penalties and legalities. The certification process of these systems is a lengthy process that requires the documentation to be done in detail.

2.9 Ethical Considerations in Fire Safety Risk Assessments

The process of fire safety risk assessment involves a considerable amount of ethical considerations. The ethical considerations involve realizing the importance and value of life and property and prioritizing them above everything else. The ethical considerations involve safeguarding the building and the people in it. In the healthcare setting these involve the patients, visitors, hospital staff, and administration (Lange et al., 2021). This ethical consideration requires stringent protocols for the risk assessments in a timely manner along with educating the people about the importance of fire safety and risk assessment (Cassidy et al., 2021). The ethical considerations also involve the development of a culture of safety. The employees should be educated and made aware of the importance of fire safety, various factors that could lead to fire accidents, legislation that involves fire safety and the processes of risk assessment so that creating a safe environment becomes a shared responsibility (Koutsos Markos et al., 2021). This will lead to better transparency and accountability among the healthcare workers and the hospital administration. This can be done through the implementation of timely educational sessions and fire drills so that everyone can recognize their responsibilities and the process of evacuation is that in times of need prompt action with complete responsibility can be taken (Heydari et al., 2022). The safety of human life is of utmost importance during an event of fire accident. For this reason, healthcare providers must have the practice of evacuating patients, especially those who are critically ill and disabled. At the same time, the duty of care and the treatment of patients should never be

stopped. In the case of fire accidents, an honest and transparent review of the whole accident should take place and the healthcare organization should take complete responsibility for the occurrence in case of any fatalities (Saghafian et al., 2020). The protocol of safety should be accountability reviewed so that no compromise takes place. The healthcare organization has the moral responsibility to develop a fire safety plan and regulations for the safety of human lives on its premises (Goniewicz et al., 2020). In Addition to the moral responsibilities, the legalities involving regulations and laws regarding fire safety must be followed. Failure to comply with these regulations results in severe penalties and the cancellation of these processes. At the same time, if a healthcare organization is affected by these legal procedures, it can lose the trust of the public and other stakeholders (Sultan et al., 2020). Proper training is required to address the potential risk of accidents related to fire in healthcare organizations. This leads to the empowerment of staff who can take full responsibility for evacuation. There is also the development of leadership and teamwork and the reputation and image of the healthcare organization improves. The community of people surrounding the healthcare organization is also at risk (Rathnayake et al., 2020). So a properly trained staff can make sure that the fire is managed effectively and if it rises it will cause risk to the life and property in the surrounding area.

In the healthcare scenario, there are various factors that are responsible for fire accidents as discussed in the previous subtopics. These can be oxygen gas, radiation, and electrical circuits in patient rooms which can compromise the safety of patients and induce fire accidents (Ivanov et al., 2022). It is essential for the healthcare staff to take complete accountability of this equipment which can act as a fire hazard (Cvetković et al., 2022). The patients are also at risk due to their inability to move or promptly react in case of a fire accident. In such a case, it is the ethical responsibility of the staff to take appropriate

steps for the protection of these patients (Kelly et al., 2021). The ethical principle that is a part of this consideration is non-maleficence which prevents the occurrence of harm to the patients due to fire accidents through the dissemination of robust evacuation plans, systems of fire suppressions, and fire drills that can develop competency and readiness for evacuating the patients (Holgersson et al., 2020). In addition to this, the principle of respect for the dignity of patients states that any process of fire safety should not hamper the rights and dignity of patients. The installation of fire safety equipment should be done in such a way that it does not cause any kind of distress or harm to the patients.

The staff must comply with the principle of beneficence which states that they should be able to take prompt action which is the most suitable for the patients and those in their surroundings (Varkey, 2020). They should be well equipped with all the competencies including the knowledge of evacuations, fire safety tools, and apparatus so that they could be used when needed (Lee et al., 2018). However, the ethical duty towards the staff should also be taken into consideration, Many healthcare organizations already suffer due to staff shortages which can negatively affect the existing staff members. Due to the high amount of work and fire safety training, they can get severe burnout and suffer from stress and anxiety. Juggling their healthcare responsibilities with fire safety training is crucial and difficult to manage. Hence the ethical principle of justice should be provided to all the staff while the responsibilities of fire safety are given to them.

2.10 Literature Gap

Firstly, the thorough analysis of a variety of research studies focussing on fire safety and risk assessments in healthcare settings displays the dominance of large urban healthcare centers. The study on primary and secondary healthcare centers, public hospitals, nursing homes, and private clinics is very limited. This provides limited insights into the efficacy

of fire risk assessments, risk factors, and challenges faced by each stakeholder in the evacuation process. All these different healthcare settings have different infrastructure, medical equipment, and resource availability so there's a difference in the fire safety protocols and probable consequences that each healthcare setting faces.

Secondly, the detection of fire has been made efficiently possible with the help of technology but there is limited evidence on how technology can be used in fire risk assessments. Thirdly, there are also very few studies that focus on the psychological perspective of fire safety management. The present research studies fail to provide evidence of the efficacy and differences made by efficient training programs and fire safety drills and the psychological readiness to mitigate fires. Fourthly, the studies fail to evaluate the efficacy of the fire safety guidelines and protocols formed for fire safety in various healthcare centers in the UK. Also, there are limited studies that assess the barriers and obstacles to the efficient application of these protocols and guidelines. Fifthly, many cross-sectional studies evaluate the effectiveness of fire safety protocol, but longitudinal studies that assess the effectiveness in the long term are absent. Sixthly, the studies that assess the impact on visitors and patients are also very limited as there are many hospitals around the world especially in developing countries where there are no electronic visitors count are not kept. Hence, there is a need to study the impact on their safety and evacuation in such cases. Moreover, the study of fire safety in diverse cultural and demographic settings is absent, which has an impact on the risk assessment as well as the acceptance of fire risk safety protocols are also absent. The studies having a biased focus on developed countries are present but the studies focused on developing countries and other third-world countries are very limited providing a biased perspective on the applicability and effectiveness of risk assessment in fire safety. Studies that focus on the financial aspect in fire safety are also absent as there should be studies which focus on

the financial efficacy of these risk assessments including the saving of financial resources through prevention of fire accidents and the finances used to implement robust fire risk assessments procedures and staff training. Lastly, there are also very limited studies that focus on the long-term psychological impact that fire accidents and risks have on patients, visitors, and healthcare workers.

2.11 Summary of the chapter

Fire safety is an essential component of the overall safety in the hospital. Risk assessments are vital for evaluating the possibilities of fire in buildings and are important components of the overall quality assessment for healthcare settings. Although Fire is a major life hazard for all, patients especially those who are critically ill and disabled form the group of people at the highest risk of fatalities in fire accidents. In Addition to them, the visitors also form a vulnerable population as they are unaware of the exit points in the hospitals. Various factors can contribute to the development of fire in a hospital. These include flammable gasses such as oxygen which is used extensively in hospitals and other chemicals that can ignite a fire accident, electrical wiring in the patient rooms, pantry, etc. Healthcare professionals have the duty of ensuring that all the patients are evacuated before the fire causes severe loss of life and property. The health care professional must be educated about risk assessments and fire safety so that they can save themselves as well as their patients. They also have to make sure that the caregiving is continued so that the critical patients are not at risk. Various novel technologies are being used for these risk assessments of fire hazards in hospitals and other buildings. Ethical considerations form a part of fire safety and are essential for the safeguarding of life and property.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Background of the chapter

This chapter consists of the methodology used for conducting the empirical research in this study. This study experimentally reviews the need for fire safety risk assessment. For the fulfilment of the aims and objectives of the study, research methodology is crucial. This methodology defines the research philosophy used in this study, the research approach on which the strategy will be based, and which fulfils the objectives to provide the most accurate answers. Also, these strategies are crucial for achieving the aims and objectives and proving the hypotheses given in this study. Further, the choice of research, along with the time frame in which the study is conducted, will also be defined in this chapter. The data collection and analysis will be the final steps which will conclude the research methodology along with highlighting the ethical consideration of this study.

3.2 Research Philosophy

As the name suggests, research philosophy consists of the philosophical ideas and assumptions that form the study's base. These are the beliefs on which the whole study is based and conducted (Kirongo and Odoyo, 2020). The research methodology is affected by the beliefs and nature of the world and society, which is reflected through its research philosophy. This is predominantly of three types - Positivism, Interpretivism, and Pragmatism. The positivist research philosophy believes in observation and measurements to find evidence to study the phenomenon which occurs in the world. This philosophy is based on the principle that for obtaining Knowledge and studying reality, objective observation of the surroundings and the measurements through systematic experimentation is necessary (Bergmann, 2023). This philosophy works through

empirical investigation through quantitative measurements, and the most positivist methods include laboratory experimentation. Quantitative methods are mostly used for provoking an existing hypothesis which tells about certain phenomena and then collects the numerical evidence of its occurrence (Pillai, and Kaushal, 2020).

The second type of research philosophy is interpretivism. This is a rather more observational philosophy based on the principle that phenomenon which occur in the world and society has their roots in the cultures and values systems of the societies in which these phenomena occur (Tamminen and Poucher, 2020). This philosophy is based on the social construction of reality and focuses on the subjective meanings following a qualitative research method. This focuses on gathering deeper details of the phenomena. The last research philosophy which is commonly used is pragmatism. This focuses on the principle there cannot be one way to interpret the realities of this world. This philosophy focuses on flexibility in conducting research and utilizing the ways which will work the best for achieving the research aims and objectives (Saliya, 2023). It also utilizes the fact that there should be a quantitative explanation for every qualitative observation. This research study is embedded in finding out the realtors of fire risk assessments in the healthcare settings in the UK. Many healthcare organizations boast to have regulations and systems in place to have periodic risk assessment and fire safety equipment. However, given the account of fire accidents in the pants especially during the COVID pandemic, it seems that the reality is far from true. Therefore, this study aims to understand the reality behind fire safety and risk assessment in healthcare in the UK. It is embedded in certain hypotheses which are provided by the authors. To gather enough evidence to prove these hypotheses as true or false, positivist philosophy will be followed in the present study. This means that this study will have a predominantly quantitative nature.

3.3 Research Approach

This is an important step that directs the researchers in formulating the study plan based on the philosophy chosen for their research study. It effectively gathers, analyses, and interprets the data required to fulfil the study's aims (Mauthner, 2020). The research approach depends on the aims and objective of the study and the nature of the research i.e. if the study is quantitative or qualitative. The most common research approaches are the inductive, deductive, and abductive approaches (Pandey and Pandey, 2021). The choice of the research approach depends on the research philosophy. With the positivist philosophy, the approach used is the deductive approach; with interpretivism, the inductive approach is used, and with pragmatism, the abductive approach is used (Al-Ababneh, 2020). The inductive approach involves the formation of thrones with the help of subjective observations. This is mostly used in qualitative research methods. It involves gathering relevant theoretical data and analysing patterns and themes to form another theory (Nayak and Singh, 2021). The inductive approach does not develop a hypothesis and theory but uses the hypothesis to collect data to fulfil the objectives. The deductive approach involves logically formulating inferences and conclusions that are stated through general ideas and then moving towards more specific conclusions (Diop and Liu, 2020).

For this reason, it is also called top-down reasoning. It mainly includes collecting data for proving hypotheses and drawing specific conclusions through that data. The abductive approach involves the search for the most suitable and likely conclusion from a set of observations. It is a reverse approach in which the hypothesis is drawn from the inferences gathered through the collected data. It is a useful approach when the topic is dynamic and constantly changing. In this study, it is already established that it is quantitative. The hypothesis in the study is that through the identification and mitigation

of potential hazards, the safety and welfare of patients may or may not be substantially ensured, identifying, evaluating, and implementing risk controls may or may not be prevalent in health care, and lastly, the risk to individuals is significantly minimized by preventing the occurrence of fire. The study requires data collection to prove these hypotheses as true or false; hence, the deductive approach will be used.

3.4 Research Strategy

After defining the research philosophy and approach for the present study, the next step involves identifying the research strategy. A research strategy is a framework that will explain the main steps of how the aims and objectives of the study will be achieved, along with the study's limitations. For evidence of fire safety and risk assessments currently being used and practiced in health organizations in the UK, there is a need for the perspectives of different healthcare professionals. Now, this perspective could either be obtained through interviews or surveys. Interviews are relatively difficult to conduct. To gather robust data needed to fulfil the aims and objectives in the study, it required that more and more people present their ideas and Knowledge of fire safety and risk assessment in a relatively easier way. The researchers of this study aimed to eliminate the limitations of longer duration and tedious tasks associated with interviews. In addition, the collection of numerical data was required to fulfil the requirements of the hypotheses. Hence, the researchers chose the survey strategy for the present study. This strategy also aligned with the chosen research philosophy and research approach. The present survey is based on the SMART method, which involves forming specific, measurable, achievable, relevant and time-bound questions. The survey's target population was also decided to be healthcare professionals who can answer the question most reasonably. The survey method can be decided by the researchers themselves,

which can increase the relevancy and eliminate limitations of the study. The choice of the questions can be determined according to the responses needed i.e. open-ended questions, multiple choice, rating scale, etc.

Hence, it can be deduced that the study is primary research. The survey in the present study depends on a convenient sampling technique as this technique provides the most favourable result in the limited time frame and financial resources. This technique can have a limitation of selection bias, which can occur due to the selection of only a limited and most relevant number of participants, thereby decreasing the generalizability of the study findings. In this study, the sample size is 100. The participants are chosen based on age, gender, nationality, and educational level. However, the nationality and educational level of the candidates are not included in the survey questions. However, people who reside in the UK and have completed their medical or nursing training have been included.

To access the chosen number of participants in the study, the survey is distributed through various social media channels. Mainly, the Internet has provided access to healthcare workers, Social media sites such as LinkedIn have been instrumental in selecting different healthcare workers who can be contacted more personally. However, to gather more responses, Facebook made it easier for the surveys to be distributed.

3.5 Research Choice and Time Frame

The research choice depends on the type of data that needs to be gathered for the study. There are predominantly two types of research choices. The Mono Method and the Mixed Method. The Mono method type of research choice is used when the data collected for the study is either qualitative or quantitative. The mixed method type of research choice is used when the data collected to fulfil the study aims and objective is

both qualitative and quantitative. The present study of primary research in which the data will be gathered through a survey strategy. Since only quantitative analysis will be conducted in this study, the research choice selected is the Mono Method. The time frame is decided by the time it took to conduct the study. The time frame in research methodology is of two types, which decide the type of study. If the time taken to conduct the study is longer, preferably one year or more, then it is considered a Longitudinal study. If the study is conducted for less than one year, it is called a Cross-sectional Study. The survey is a relatively easier and quicker method of collecting data. Hence, the present study is cross-sectional.

3.6 Data Collection and Analysis

It is the process by which data is collected in the study. The data collection method used in the present study is a Survey. A set of 15 questions are prepared in the multiple-choice format. These questions aim to analyze and understand the awareness of fire safety and risk assessments in the healthcare provider population. It also assesses the level of preparedness among them. The survey was conducted via Google Forms, which analyzed the responses graphically. Further, statistical analysis was done via SPSS, through which the descriptive statistical analysis was done.

Questionnaire:

The questions of the study will be based on the topic of following item. First two questions are of demographic factors. 3rd and 4th would of awareness regarding fire safety legislation and safety protocols. Question 5th, 6th and 15th on the basis of fire risk assessment and rest would be based on the Knowledge about fire Safety.

Question number	Item	Type
Q1	Age	Values
Q2	Gender	Male/Female/Other
Q3	Awareness regarding Fire Safety Legislation in the UK	Yes/No/Maybe
Q4	Awareness regarding fire safety protocols of individual healthcare organizations in the UK	Yes/No/Maybe
Q5	Knowledge about fire risk assessment	Multiple Choice Question
Q6	Knowledge about fire risk assessment	Multiple Choice Question
Q7	Knowledge about fire Safety	Yes/No/Maybe
Q8	Knowledge about fire Safety	Multiple Choice Question
Q9	Knowledge about fire Safety	Multiple Choice Question
Q10	Knowledge about fire Safety	Multiple Choice Question
Q11	Knowledge about fire Safety	Yes/No/Maybe
Q12	Knowledge about fire Safety	Yes/No/Maybe

Q13	Knowledge about fire Prevention	Multiple Choice Question
Q14	Knowledge about fire Safety	Yes/No/Maybe
Q15	Knowledge about fire risk assessment	Yes/No/Maybe

The data analysis of data gathered through the questionnaire is analyzed using the statistical software SPSS. It is a platform with vast amounts of statistical libraries containing machine learning algorithms, text analysis, and open-source databases with a high degree of integration with big data and is very easily connected to different applications. This software allows users to analyze a wide range of data at all levels of size and complexity, all while improving the efficiency of data analysis tools and minimizing the risks. This software offered varied advantages which have been used for conducting the data analysis by the researchers. Firstly, this platform has been chosen as this provides an easy-to-use interface for all researchers. It also improves the level of productivity of researchers by providing innovative graphical visualization of data.

3.7 Ethical Considerations

This study has been conducted after taking care of all the ethical considerations which should have been included in the study. Ethical considerations are the morals and values which should be abided by when conducting research. These are essential for upholding the integrity of the work conducted and maintaining the highest professional standards. Ethical consideration involves providing complete information about the study of the project to the participants before involving them. This is necessary to obtain prior

informed consent before involving human participants. It is the researchers' duty to understand the nature, aim, objectives, significance and risks involved in the study. The present study is based on ethical values and adheres to research morals so that the authenticity and reliability of the study can be maintained. The various principles of ethical consideration in the research involve informed consent, voluntary participation, and proper communication between all stakeholders. Ethical considerations are important as they maintain accountability in the study and avoid conflict and misconduct.

Summary of the Chapter

The chapter involves a brief, detailed outline of the research methodology used in the present study. The research philosophy used in the study is positivism, as it is necessary where the quantitative measurements have to be done. The research approach will be deductive as this will help the researchers prove the hypotheses in the present study by collecting all the relevant data. The research strategy used in the present study is a survey strategy for collecting the relevant data. Since only quantitative analysis is conducted, the research choice is a mono method. The study is for a short period, and hence the study is cross sectional. The collection for the study is done through an online survey and the data analysis will be done through SPSS.

CHAPTER 4: RESULTS

Background of the chapter

This chapter will have an in-depth analysis of the results obtained through the survey to formulate the study's empirical findings. After the survey is obtained from 100 participants who were healthcare practitioners, it is analyzed with the help of SPSS. The descriptive statistics and correlation between the various variables were obtained.

4.1 Demographic Findings

The study's primary data was obtained with the help of Google Forms, an online surveying tool. The sampling was done through social media platforms. A total of 100 participants have provided the responses who have completed their medical and nursing degrees, and their ages varied between 18 to above 38 years. As can be figured out from Table 1, out of the responses, 48% of the people who responded had their ages 18-24 years, while 25% of the respondents were between 25-32 years. 21% of the responders were between 33-37, and only 6% were above 38 years old. The rationale behind selecting a relatively younger population of healthcare workers who averaged between the ages of 18-24 years was to understand the early perspectives of the healthcare workforce and to check their understanding and awareness of fire safety and risk assessment before being specifically educated on the issue. Understanding this is crucial as the individuals who are sufficiently aware of the fire safety problem will perform their best in the event of fire accidents to improve their and others' safety. Table 2 provides the percentages of different genders among the responders. Of the genders, 48% of the responses were female, and 43% were male. The remaining 9% of responders chose not to answer the question. A graphical representation of the above can be seen through the figures 5 and Figure 6.

What is your age?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Above 38 years	6	6.0	6.0	6.0
	Between 18-24 years	48	48.0	48.0	54.0
	Between 25-32 years	25	25.0	25.0	79.0
	Between 33-37 years	21	21.0	21.0	100.0
	Total	100	100.0	100.0	

Table 1: Table represents the frequency and percentages of participants who were in their respective age groups

What is your Gender?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	48	48.0	48.0	48.0
	Male	43	43.0	43.0	91.0
	Prefer not to say	9	9.0	9.0	100.0
	Total	100	100.0	100.0	

Table 2: The table represents the gender distribution of the participants

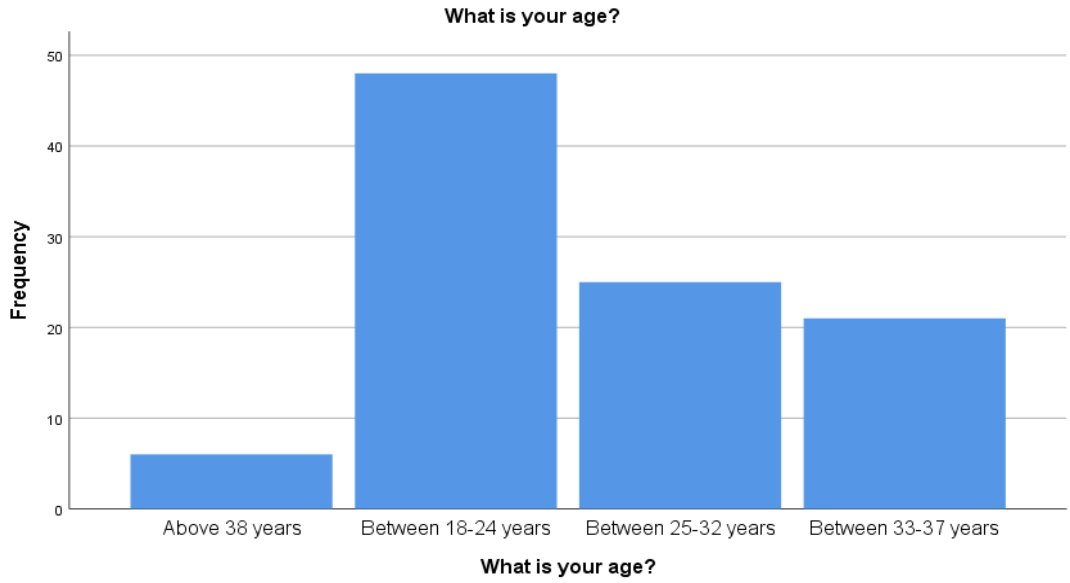


Figure 5: This figure graphically represents the distribution of different age groups within the population of responders

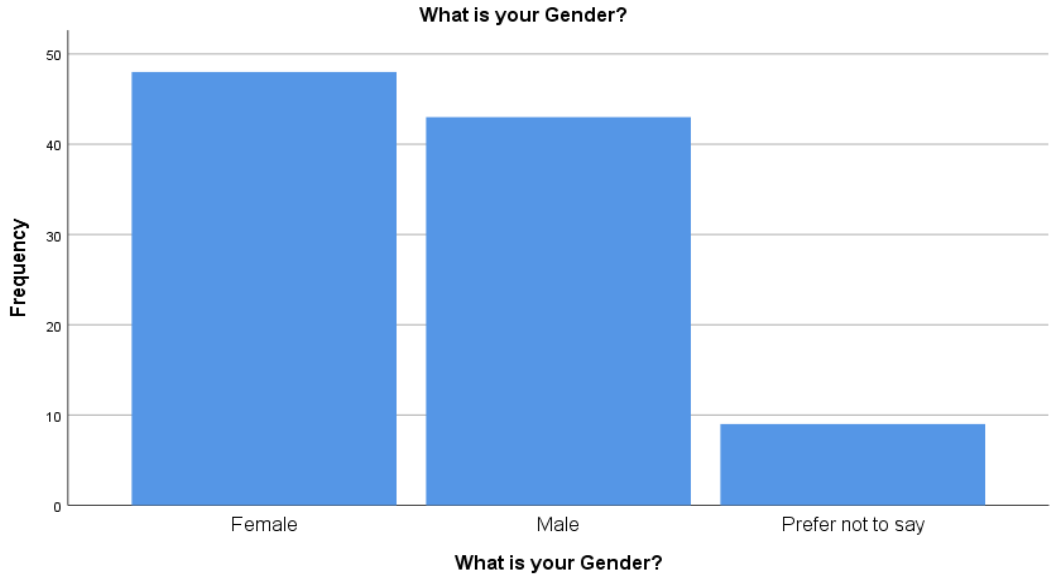


Figure 6: The figure represents the distribution of different genders in the population of responders

4.2 Findings of assumptions-based questions on knowledge and awareness of fire safety among the population of healthcare providers

The following findings obtained through the survey are based on some assumptions. These are 0=Maybe, 1=Yes, 2=No, and 3=Can't say. There were various questions in the survey which aimed to evaluate the Knowledge and awareness of the healthcare workers about fire safety. The question which assessed the 'Need for specific legislation for fire safety' has been answered by all the 100 responders. It can be inferred from Table 3 and Figure 7 that 67% of the respondents answered positively that specific legislation regarding fire safety in healthcare should be formulated. 24% of the respondents provided with No while the rest 9% were unsure of the need for fire safety legislation and responded with a Maybe.

Do you think it should be necessary to have legislation regarding fire safety and risk assessments in healthcare?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maybe	9	9.0	9.0	9.0
	No	24	24.0	24.0	33.0
	Yes	67	67.0	67.0	100.0
	Total	100	100.0	100.0	

Table 3: The responses highlighting the need for specific legislation regarding fire safety and risk assessment in healthcare in the UK.

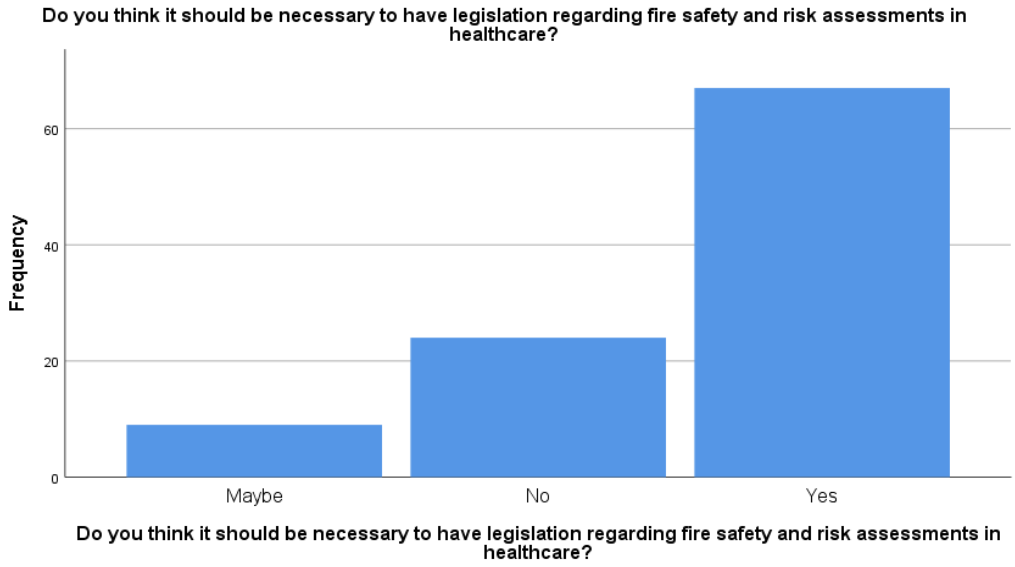


Figure 7: Graphical representation of the responses to the question assessing the 'Need of specific legislation for fire safety'.

The next question enquired about 'the need for fire safety protocols and regulation made by individual health care organizations'. About 70% of the participants responded with a Yes, which proves that the participants were well aware of the repercussions of not having fire safety protocol and standards in healthcare organizations. 18% of the participants responded with a No and 12% were not sure about the need of individual standards and regulation by each health care organization and hence responded with a Maybe as depicted in Table 4 and Figure 8.

Do you think that necessary fire risk assessment protocols should be developed by all healthcare organizations?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maybe	12	12.0	12.0	12.0
	No	18	18.0	18.0	30.0
	Yes	70	70.0	70.0	100.0
	Total	100	100.0	100.0	

Table 4: The responses highlight the need for fire safety and risk assessment protocols by health care organizations.

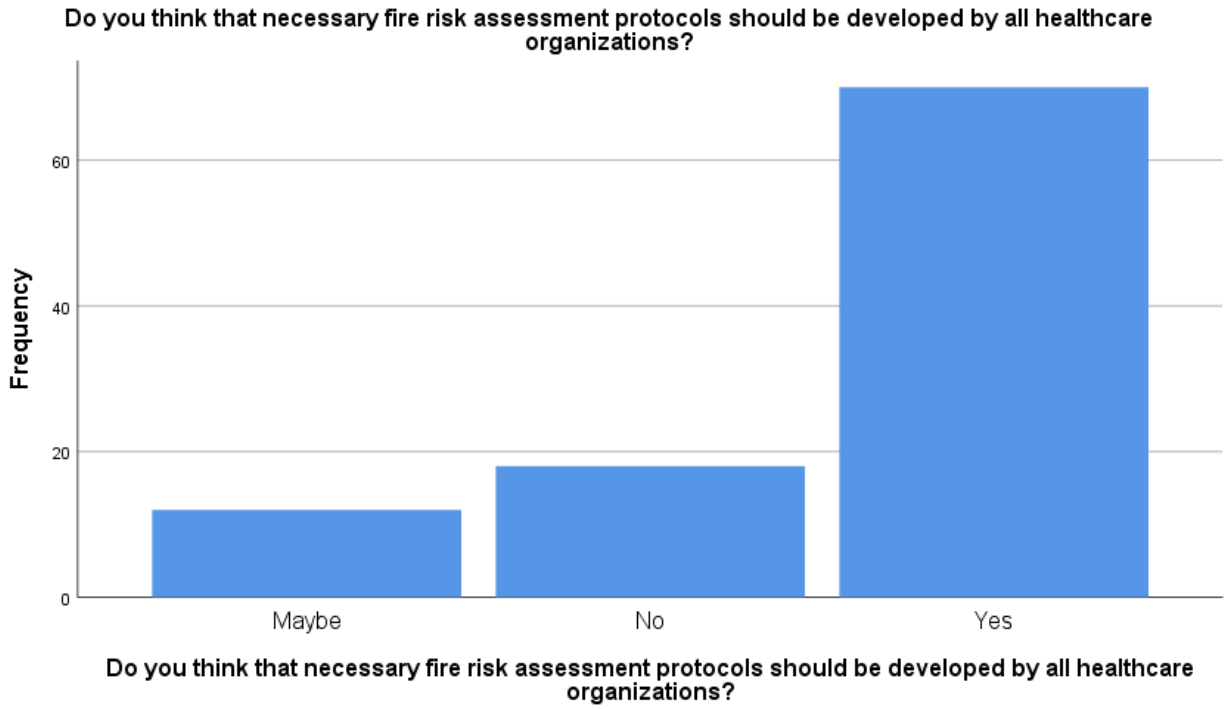


Figure 8: The given figure graphically represents the need for fire safety and risk assessment protocols by health care organizations.

The next assumption-based question evaluates 'the need and awareness about fire safety drills in the healthcare organizations.' All the 100 participants responded to these questions. From Table 5 and Figure 9, it can be inferred that 64% of the participants responded with a Yes, proving that the healthcare providers realize the need for fire safety drills in the healthcare organizations and would willingly participate wherever they were given an opportunity. 27% of the participants responded with a No and 9% with a Maybe. This proves that more awareness and education is required among the healthcare workers regarding fire safety drills to instil readiness for fire accidents.

Do you think that it should be compulsory to have fire drills in healthcare organizations?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maybe	9	9.0	9.0	9.0
	No	27	27.0	27.0	36.0
	Yes	64	64.0	64.0	100.0
	Total	100	100.0	100.0	

Table 5: The table highlights the responses to the need and awareness about fire safety drills in healthcare organizations.

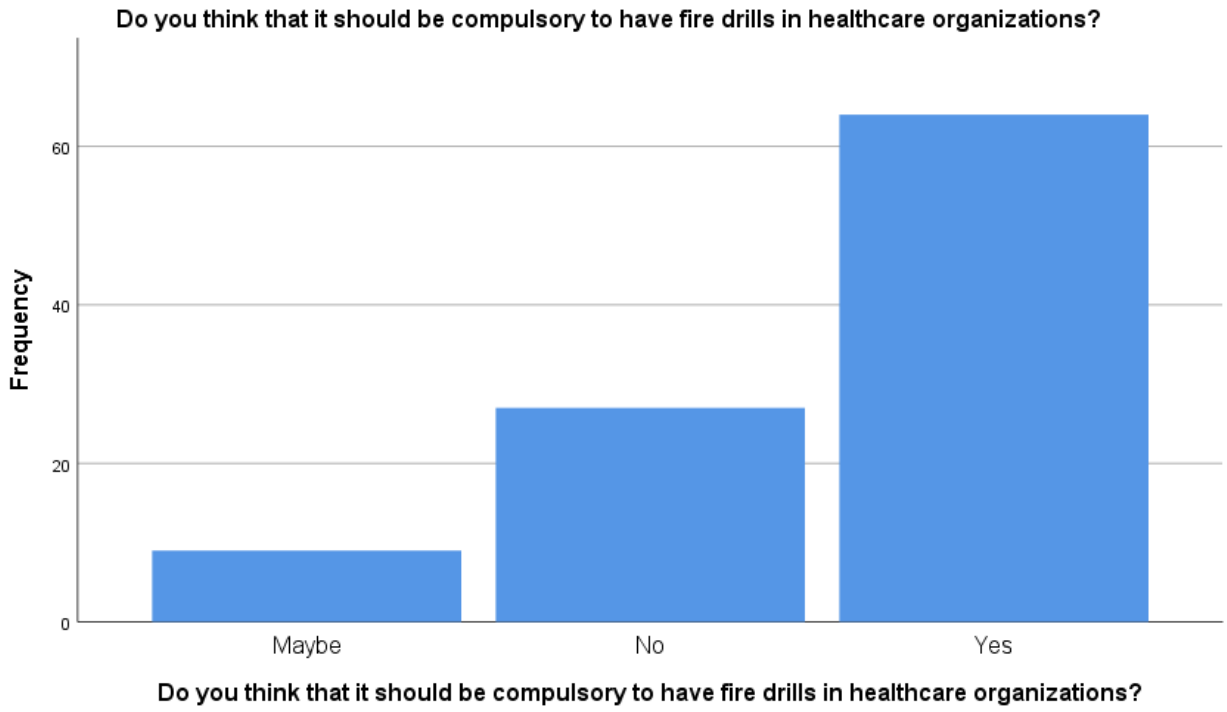


Figure 9: The given figure is the graphical representation of the responses for the evaluation of the need for fire safety drills in healthcare organizations.

The participants were asked about 'the need for fire alarms in all hospital areas or only at specific areas. As can be inferred from Table 6 and Figure 10, about 64% of the participants responded with

a Yes that fire alarms should be present in all the areas in the hospitals including parking washrooms, visitor rooms, etc. 21% of the participants responded with a No while 15% responded with Maybe which clearly showed the lack of Knowledge about the uses and benefits of healthcare professionals about fire alarms.

Do you think fire alarms should be present in all the areas in hospitals?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Can't say	15	15.0	15.0	15.0
	No	21	21.0	21.0	36.0
	Yes	64	64.0	64.0	100.0
	Total	100	100.0	100.0	

Table 6: The table represents the responses for the need of fire alarms in all the areas in the hospital

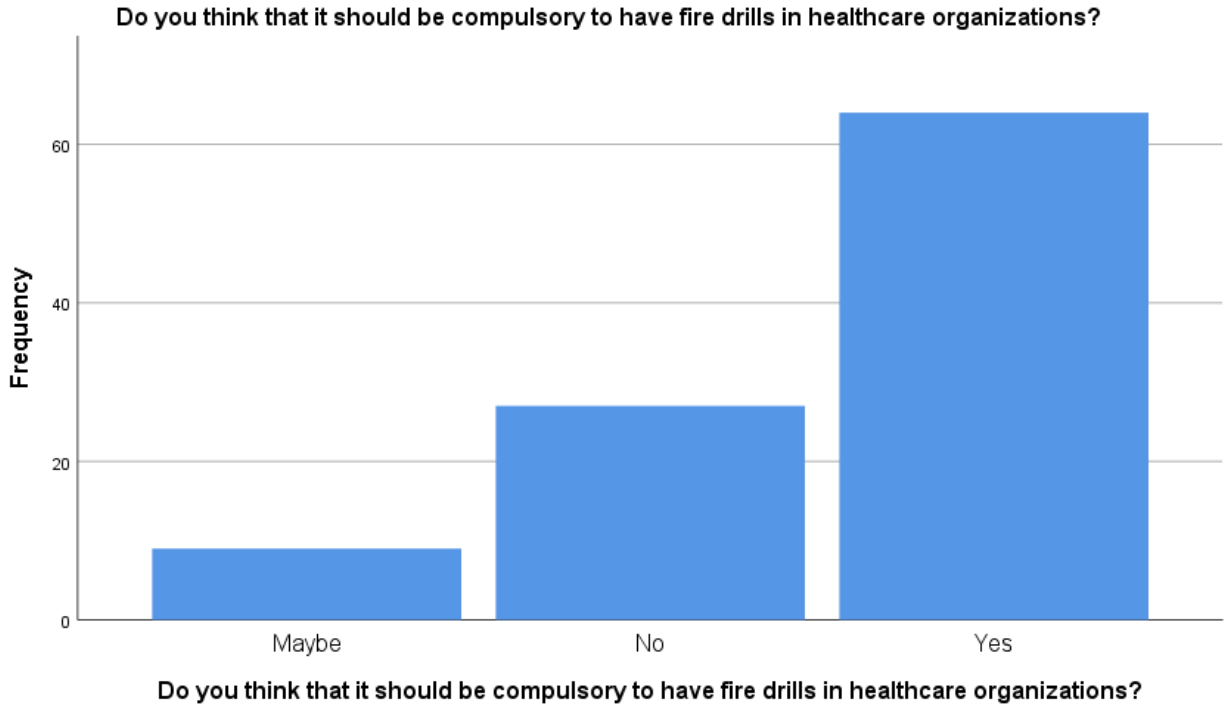


Figure 10: This figure is a graphical representation of the responses of the participants to the question of the need of fire alarms in all the area in the hospital

Healthcare providers are well aware of different chemicals which are flammable and combustible and can easily catch fire so they were asked whether these flammable and combustible chemicals should be kept in a separate facility to prevent them from catching fires. It can be inferred from Table 7 and Figure 11 that 70% of the healthcare providers responded with a Yes, while 15% responded with a NO and 15% responded with a Maybe. This highlights the fact that the healthcare workers understand that many fires can be avoided if chemicals are kept separately where minimum number of people are present.

Do you think that chemicals that catch fire easily should be kept in a separate facility to prevent accidents?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maybe	15	15.0	15.0	15.0
	No	15	15.0	15.0	30.0
	Yes	70	70.0	70.0	100.0
	Total	100	100.0	100.0	

Table 7: The table highlights the frequency of responses and percentage of participants for the question that assesses the need to keep chemicals separately.

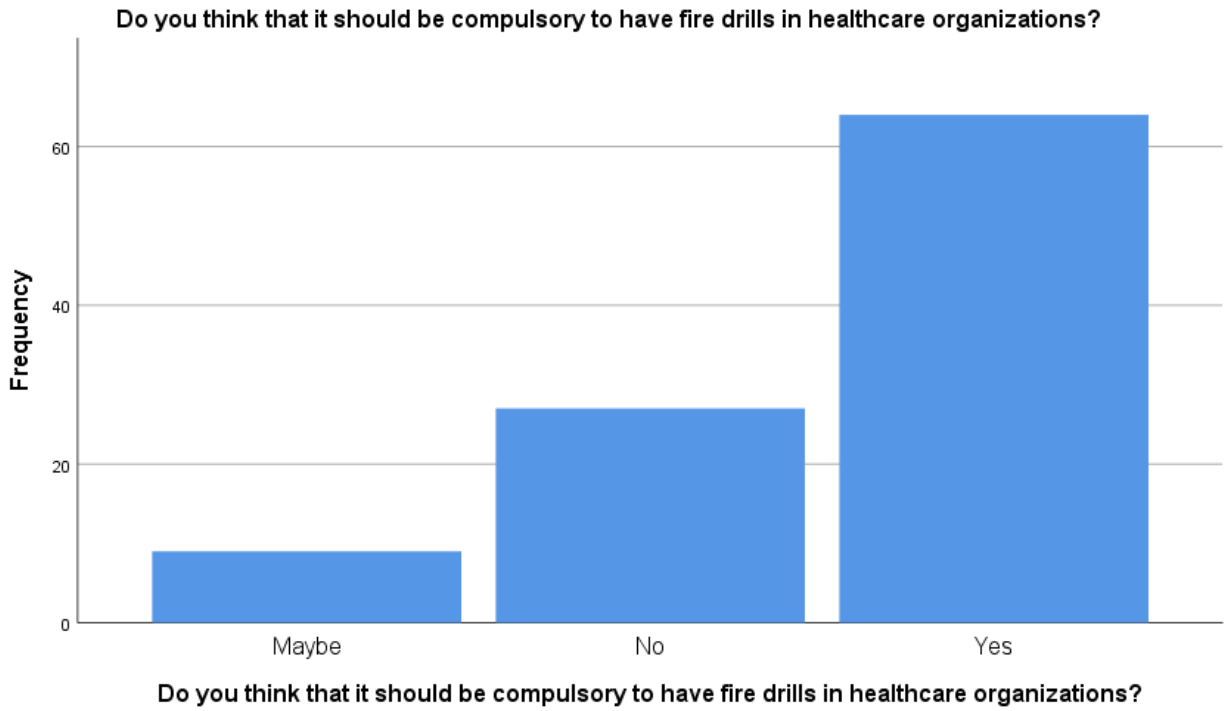


Figure 11: The given pie chart is the graphical representation of the percentage of participants for the question that assesses the need to keep chemicals separately.

The participants were also asked whether 'it is important to have the maps of important emergency exhaust in all the areas in the hospital'. The participants' responses can be inferred from Table 8 and Figure 12. About 65% of the participants responded with a Yes, while 19% responded with a No and 16% responded with a maybe.

Do you think it is important to install maps for emergency exits in all the areas in hospitals?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maybe	16	16.0	16.0	16.0
	No	19	19.0	19.0	35.0
	Yes	65	65.0	65.0	100.0
	Total	100	100.0	100.0	

Table 8: The table highlights the need to install maps in the hospital for all the emergency exits in the hospital.

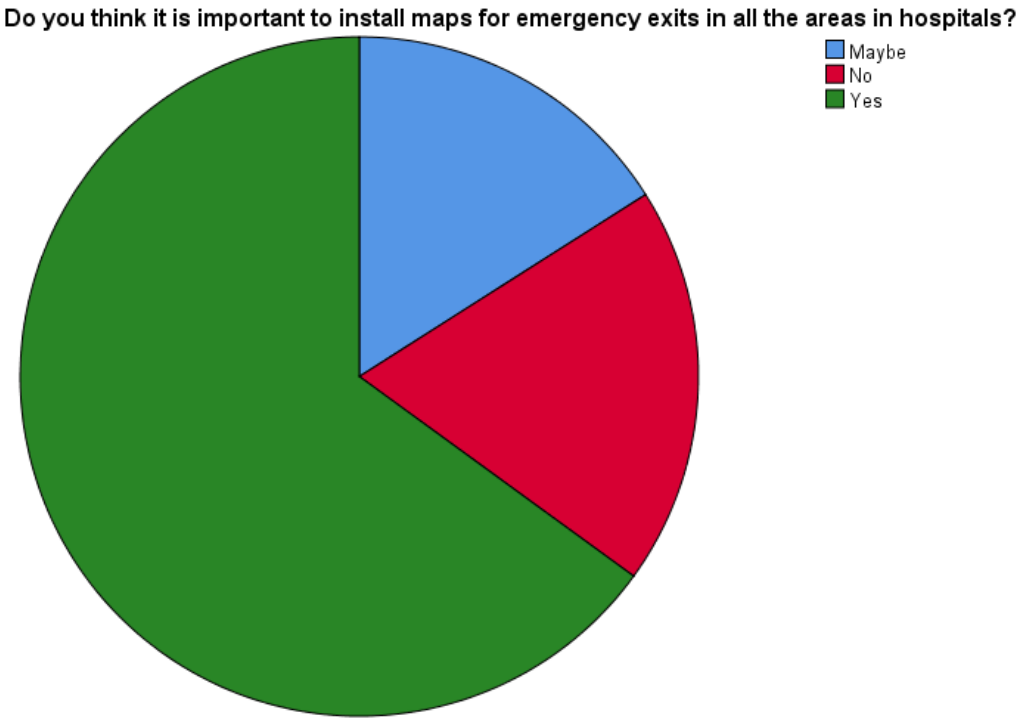


Figure 12: The figure highlights the percentage of different responses from the participants when they were asked about the need for fire alarms in all the areas in the hospital

Next the participants were asked about 'the need for use of advanced technology in fire safety and risk assessments in the hospitals'. The participants' responses can be inferred from the Table 9 and Figure 13. 71% of the participants responded with a Yes, which highlights the fact that the majority of the healthcare professionals are aware of the use of technology in fire safety. 19% of the participants responded with a No, and 10% of the participants responded with a Maybe.

Do you think technology can be used for conducting fire risk assessments?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maybe	10	10.0	10.0	10.0
	No	19	19.0	19.0	29.0

	Yes	71	71.0	71.0	100.0
	Total	100	100.0	100.0	

Table 9: The table highlights the responses of participants when enquired about the need for the integration of technology in fire safety and risk assessments.

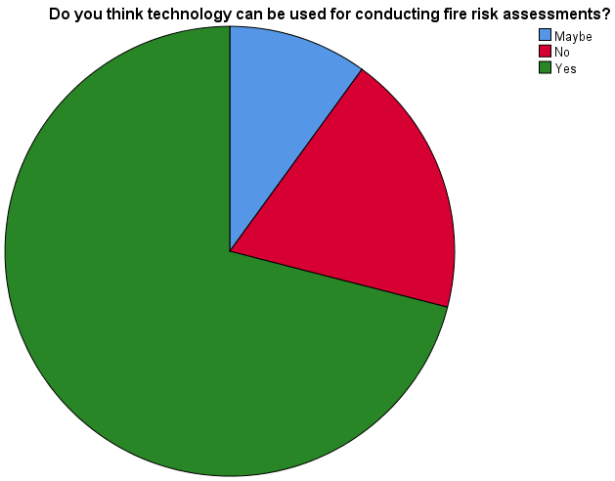


Figure 13: The figure represents the percentage of different responses of the participants.

4.4 Findings of the Knowledge-based Questions

The participants were asked to evaluate their level of Knowledge and general awareness of fire safety and risk assessments in healthcare organizations in the UK. The question asked was about 'the major component of fire risk assessments'. Of the four options provided to the participants, 37% responded that Fire hazards are the most important component of fire risk assessment, as shown in Table 10 and Figure 14. 33% of the participants responded that the Budget is the most imprint component of fire risk assessments. 20% responded that emergency exit is the most important component of fire risk assessment, while only 10% said that patients are the most important component.

What is the major component of fire risk assessments?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Budgets	33	33.0	33.0	33.0
	Emergency Exits	20	20.0	20.0	53.0
	Fire hazards	37	37.0	37.0	90.0
	Patients	10	10.0	10.0	100.0
	Total	100	100.0	100.0	

Table 10: The table represents different responses of the participants when assessed on the most important component of fire safety risk assessment.

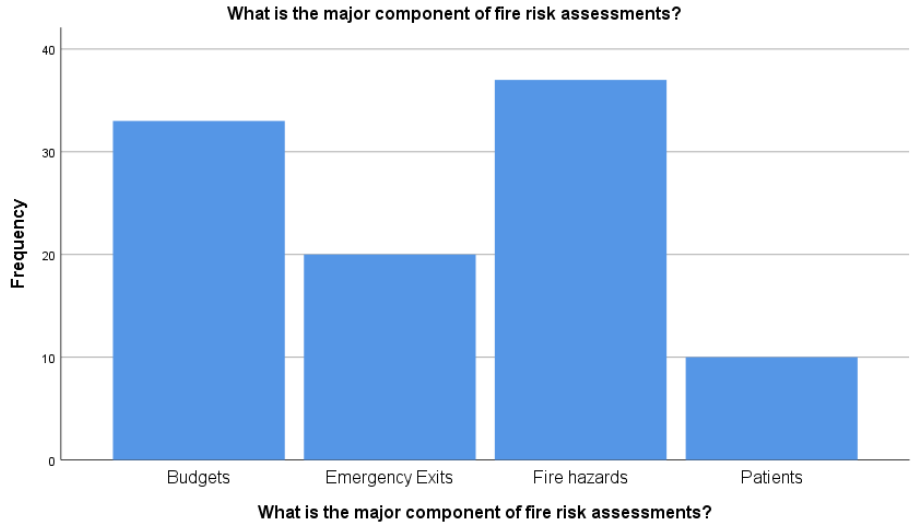


Figure 14: The figure shows which component according to the study population is the most important component of fire risk assessment.

Next, the participants were asked about 'the frequency of fire risk assessments which they think should be done'. 47% of the participants responded that the risk assessment should be done annually, while 26% responded that they should be done biannually. 18% of the participants said that it should be done every 2 years, while only 9% of the participants responded that it should never be done. This percentage depicts that healthcare providers understand the need for fire safety risk assessments.

How many times do you think the fire risk assessments should be done?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Annually	47	47.0	47.0	47.0
	Biannually	26	26.0	26.0	73.0
	Every two years	18	18.0	18.0	91.0
	Never	9	9.0	9.0	100.0
	Total	100	100.0	100.0	

Table 11: The table represents the responses of the participants when assessed about the frequency of compulsory risk assessments.

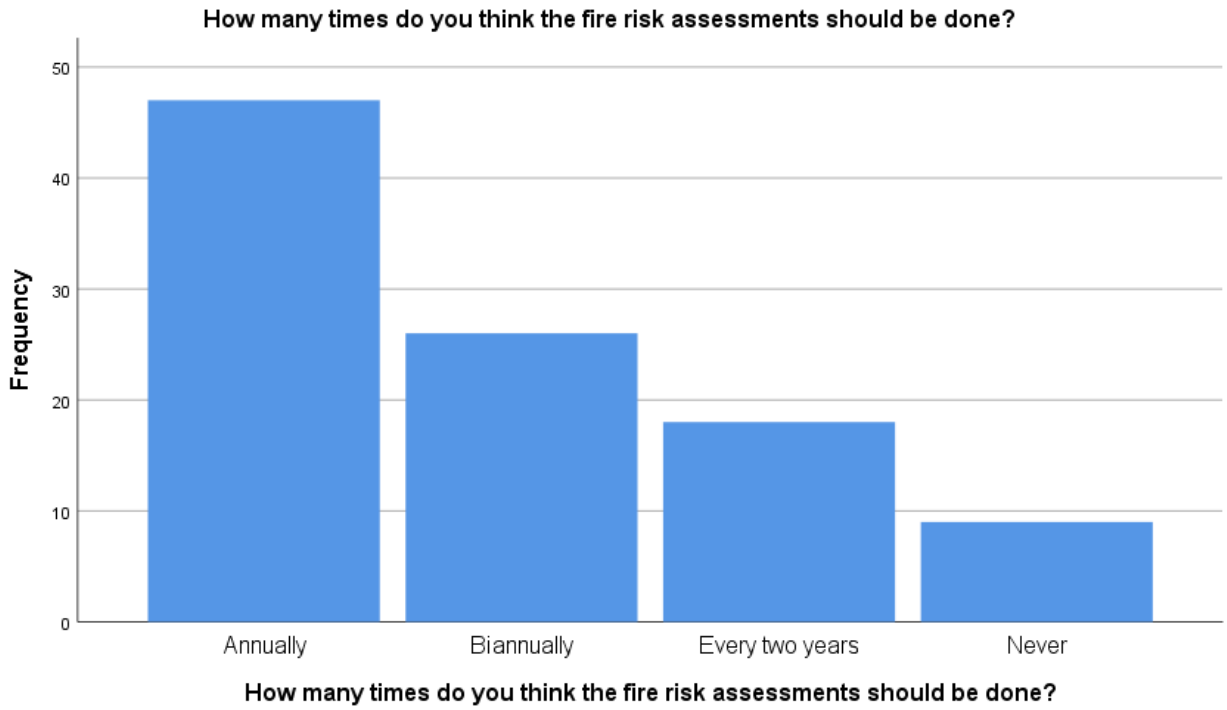


Figure 15: The figure shows the percentage of frequency of risk assessment in the healthcare sector.

The participants were then asked about 'the most at-risk population during a fire accident in a hospital'. 61% of the participants, which also firm the minority, responded that disabled patients and visitors

firm the most at-risk population and is the highest risk during fire accidents in a hospital. 22% of the participants responded that hospital staff is at the highest risk, and 17% responded that administration is the highest risk during a fire accident, as inferred from Table 12 and Figure 16.

Who do you think is the most at-risk during fire evacuations?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Administration	17	17.0	17.0	17.0
	Disabled patients and visitors	61	61.0	61.0	78.0
	Hospital Staff	22	22.0	22.0	100.0
	Total	100	100.0	100.0	

Table 12: The table represents the responses of the patient when asked about the most at-risk group of people in a fire accidents at a hospital

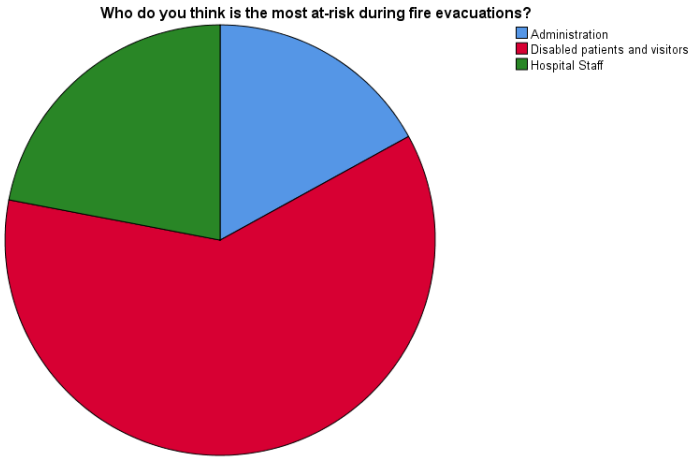


Figure 16: The pie chart represents the most at-risk group of people in a fire accidents at a hospital

The next question the participants were asked was about the 'area which should have the maximum measures of fire safety in a hospital'. The majority of the participant as it can be inferred through the Table 13, 42% of the participants responded that patient rooms are the areas which should have the

maximum measures of fire safety. 33% of the participants responded that parking lots should have the maximum safety measures, 17% participants responded to pantries while 8% participants responded that visitors' areas should have the maximum measures of fire safety.

Which area in a hospital should have the maximum measures for fire safety?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Pantry	17	17.0	17.0	17.0
	Parking lots	33	33.0	33.0	50.0
	Patient rooms	42	42.0	42.0	92.0
	Visitors area	8	8.0	8.0	100.0
	Total	100	100.0	100.0	

Table 13: The table represents the responses about the area which should have the maximum safety measures in the hospital

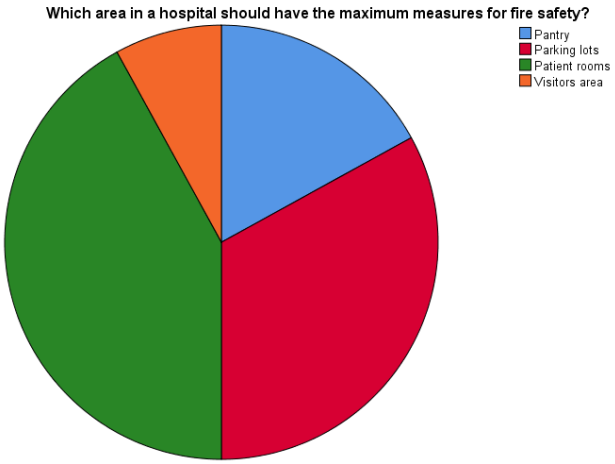


Figure 16: The figure shows the areas with the maximum fire safety measures according to the participants in the survey.

The next question that the participants were asked was about 'the easiest way with which they could integrate fire safety training for healthcare workers practically in their routines'. The maximum

number of participants responded that the fire safety training for healthcare workers could be integrated practically by conducting regular fire drills. 22% responded that by conducting monthly meetings, fire safety training could be integrated practically, 21% said that through annual meetings while 8% said that by taking classes for the healthcare workers, fire safety training could be integrated practically for the healthcare workers. These responses could be inferred from the Table 14 and Figure 17 provided below.

What do you think is the easiest way hospitals can integrate fire safety practically?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	By conducting fire drills	49	49.0	49.0	49.0
	By monthly meetings	22	22.0	22.0	71.0
	By taking classes	8	8.0	8.0	79.0
	Through annual meetings	21	21.0	21.0	100.0
	Total	100	100.0	100.0	

Table 14: The table illustrates the responses of the participants when enquired about the easiest way fire safety can be integrated by the hospitals most practically.

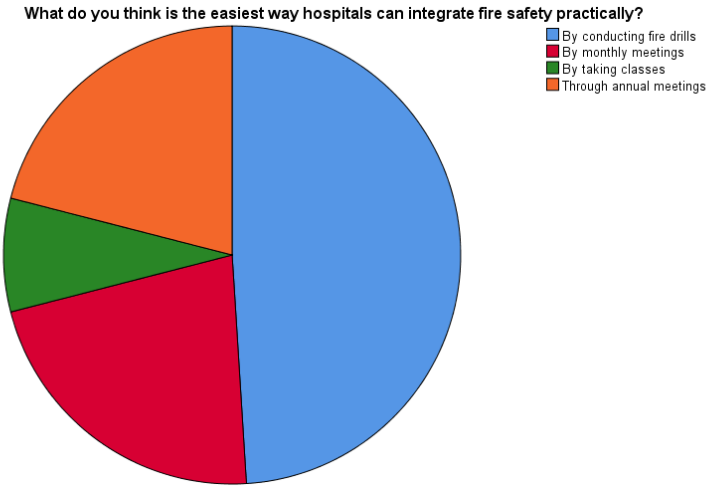


Figure 17: The figure depicts the easiest way with which hospitals could integrate fire safety most practically.

The last question the participants were asked was the 'most common material which can be used for prevention of fires in the hospitals' The majority of participants (61%) responded that fire resistant materials should be the most common material of fire prevention in hospitals. 26% responded that open floor plans should be the most common for fire prevention in the hospitals. At the same time, 13% responded that the aesthetic should be most common to prevent hospital fires. The responses provided by the participants can be seen in the Table 15 and Figure 18 provided below.

What should be the most common material for fire prevention in hospitals?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Aesthetics	13	13.0	13.0	13.0
	Fire resistant materials	61	61.0	61.0	74.0
	Open floor plans	26	26.0	26.0	100.0
	Total	100	100.0	100.0	

Table 15: The table illustrates the responses of the participants when asked about the most common material for prevention of fire in the hospital.

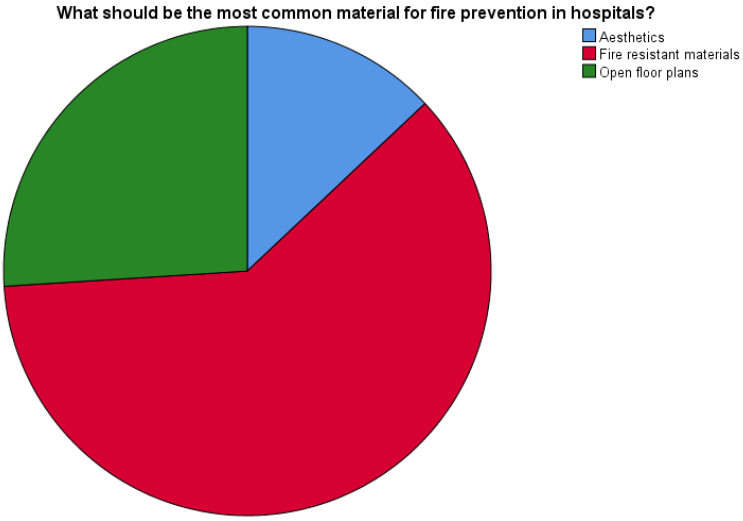


Figure 18: The figure depicts the most common material that can be used for fire prevention in the hospital

4.5 Descriptive Analysis on the basis of Assumption-based questions

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Do you think it should be necessary to have legislation regarding fire safety and risk assessments in healthcare?	100	0	2	1.15	.557
Do you think that necessary fire risk assessment protocols should be developed by all healthcare organizations?	100	0	2	1.06	.547
Do you think that it should be compulsory to have fire drills in healthcare organizations?	100	0	2	1.18	.575
Do you think fire alarms should be present in all the areas in hospitals?	100	1	3	1.51	.745
Do you think that chemicals that catch fire easily should be kept in a separate facility to prevent accidents?	100	0	2	1.00	.550
Do you think it is important to install maps for emergency exits in all the areas in hospitals?	100	0	2	1.03	.594
Do you think technology can be used for conducting fire risk assessments?	100	0	2	1.09	.534
Valid N (listwise)	100				

A mean value of 1.15 defines that it must be necessary for the healthcare businesses to have legislation associated with fire safety and risk assessments. Moreover, 1.06 mean defined that 90% people opted yes to state that fire assessment protocols must be evolved by healthcare firms. Also, the mean value of 1.18 defines that fire drills need to be integrated into the healthcare systems in the UK. The standard deviation value of all three points defines that the data is likely to be scattered with the value between .5 and .6. Fire alarms must be compulsory for healthcare as defined by the descriptive data and defines that standard deviation of .745 that data is the least scattered with the original value. This can be understood by all elements with a mean value of 1.51, 1.0, 1.03, and 1.09, defined that chemicals catches the fires easily in the healthcare sector, installing maps for the emergency exists in the healthcare sector leads to better-escaping places and deals with the risks as well. Also, the integration technology within the healthcare risks assessments evaluated the overall value of the healthcare business.

4.6 Correlation Analysis

Correlations

		Do you think it should be necessary to have legislation regarding fire safety and risk assessments in healthcare?	Do you think that necessary fire risk assessment protocols should be developed by all healthcare organizations?	Do you think that it should be compulsory to have fire drills in healthcare organizations?	Do you think that chemicals that catch fire easily should be kept in a separate facility to prevent accidents?	Do you think it is important to install maps for emergency exits in all the areas in hospitals?	Do you think technology can be used for conducting fire risk assessments?
Do you think it should be necessary to have legislation regarding fire	Pearson Correlation	1	.467**	.388**	.395**	.017	.294**
	Sig. (2-tailed)		.000	.000	.000	.868	.003

safety and risk assessments in healthcare?	N	100	100	100	100	100	100
Do you think that necessary fire risk assessment protocols should be developed by all healthcare organizations?	Pearson Correlation	.467**	1	.447**	.335**	-.006	.293**
	Sig. (2-tailed)	.000		.000	.001	.956	.003
	N	100	100	100	100	100	100
Do you think that it should be compulsory to have fire drills in healthcare organizations?	Pearson Correlation	.388**	.447**	1	.223*	.014	.210*
	Sig. (2-tailed)	.000	.000		.026	.893	.036
	N	100	100	100	100	100	100
Do you think that chemicals that catch fire easily should be kept in a separate facility to prevent accidents?	Pearson Correlation	.395**	.335**	.223*	1	.309**	.447**
	Sig. (2-tailed)	.000	.001	.026		.002	.000
	N	100	100	100	100	100	100
Do you think it is important to install maps for emergency exits in all the areas in hospitals?	Pearson Correlation	.017	-.006	.014	.309**	1	.278**
	Sig. (2-tailed)	.868	.956	.893	.002		.005
	N	100	100	100	100	100	100
Do you think technology can be used for conducting fire risk assessments?	Pearson Correlation	.294**	.293**	.210*	.447**	.278**	1
	Sig. (2-tailed)	.003	.003	.036	.000	.005	
	N	100	100	100	100	100	100
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

The above data showed no strong correlation between all the elements and variables attached in the above table. Also, the above data defined that there is only a positive correlation but with the moderate value and the least relation between them. The data even represented that the value attached in the above table is less than .5, which defines that all variables have a low or weak correlation. This can be understood with the use of the example that is, if it is necessary to have fire legislation at the workplace or healthcare sector or premises, then it is necessary to have fire drills, risk assessments,

installation of maps and integration of the technology in the workplace to reduce the risks of the fire in the healthcare sector.

4.7 Summary of the findings

After reviewing the findings, it can be concluded that females between the ages of 18 and 24 have the maximum participation in the survey. The healthcare workers believe that there should be legislation regarding fire safety and risk assessments in healthcare and all healthcare organizations should develop the fire risk assessment protocols. Moreover, according to the participants, fire hazards are the most important components of risk assessments which should be conducted annually. The majority of the participants believe that it should be compulsory to have fire drills in healthcare organizations. Disabled patients and visitors are the group of population with the maximum risk during fire accidents. The patient rooms should have the maximum measures for fire safety. Conducting fire drills according to the participants is the easiest way hospitals can integrate fire safety practically. Most healthcare workers also believe that fire alarms should be present in all hospital areas and chemicals that catch fire easily should be kept in a separate facility to prevent accidents. At the same time, it is important to install maps for emergency exits in all hospital areas and technology can be used for conducting fire risk assessments. Fire-resistant materials are the most common material for fire prevention in hospitals. It was also concluded that conducting fire drills is the easiest way hospitals can integrate fire safety practically. Lastly, patient rooms should have the maximum measures for fire safety.

CHAPTER 5: DISCUSSION

Background of the Study

This chapter provides a comprehensive explanation of the results obtained in this study. The discussion of the results obtained through the quantitative study is crucial to explain the rationale behind the type of results and data obtained after the survey used in quantitative analysis. The data collection in this study has been done with a survey strategy where 15 questions that investigated the participants' awareness and knowledge of fire risk assessment and safety were included. Then, the responses obtained through these questions were quantitatively analyzed through the data analysis tool SPSS. The descriptive analysis and correlation were obtained. Further, in this section, the quantitative data will be discussed with the help of evidence available through scientific investigations, and implications, opportunities, and limitations of fire safety and risk assessments will be discussed.

5.1 Level of Awareness and Knowledge among the healthcare professionals in the UK regarding Fire Safety and Risk Assessments

The data gathered through the survey provides interesting insights about fire safety and risk assessments among healthcare professionals in the UK. Firstly, the sample population for the survey also included people between 18-38 years of age. These people also included medical students who are in the early stages of their medical careers. They are included to understand their level of awareness, knowledge, and preparedness in the field of risk assessment and fire safety. The majority of participants are a relatively younger population of healthcare workers who averaged between the ages of 18-24 years to understand the early perspectives of the healthcare workforce and to check their

understanding and awareness of fire safety and risk assessment before being specifically educated on the issue. Understanding this is crucial as the individuals who are sufficiently aware of the fire safety problem will perform their best in the event of fire accidents to improve their and others' safety.

The results obtained for the level of awareness in the healthcare professionals in the UK healthcare sector, although there are varying levels of awareness, it can be said that the majority of healthcare professionals are aware of various facets of fire safety and risk assessments. Healthcare professionals understand the need for fire safety and risk assessments and the legislation associated with it. A study by Sujan et al. (2015) also provides insights into the level of awareness of fire safety and risk assessments. The researchers state that healthcare professionals in the UK healthcare sector have developed a robust awareness and understanding of fire safety and this enables the healthcare professionals to adopt a proactive and risk-driven approach for risk assessment and fire safety. This understanding of the risk levels in healthcare settings has enabled healthcare organizations to implement an acceptable level of safety.

This understanding has provided the need for fire drills in these healthcare organizations and the responses obtained from the participants have proved that the healthcare providers realize the need for fire safety drills in the healthcare organizations and would willingly participate wherever they were given an opportunity. However, not all healthcare professionals recognize the need for fire drills which is seen from the responses of participants. This proves that more awareness and education are required among healthcare workers regarding fire safety drills to instill readiness for fire accidents. The awareness regarding fire safety also enables people to understand the need for fire alarms. The study by Omidvari et al. (2020) provided evidence of the need for automatic fire

alarms. The researchers state that the absence of automatic fire alarms can increase the need for fire accidents. Another study by Agus Salim et al. (2023), states that the policies regarding fire safety in all settings, including healthcare settings, must have automatic fire alarms as an important fire safety management equipment. Wróblewski et al. (2022), through their studies, also establish that fire safety risks are reduced to a significant level when the fire alarms, along with other equipment such as automatic sprinkler systems, hydrant systems etc., are used for the mitigation of fires as part of the fire prevention in healthcare settings. These reduced the risk of many casualties and saved thousands of lives and property.

Healthcare providers are also aware of distinct types of risks in healthcare settings. Through the survey, it has been recognized that chemicals are as important in initiating fire accidents as electrical systems. The healthcare providers were well aware of different flammable and combustible chemicals that can easily catch fire, so they were asked whether these flammable and combustible chemicals should be kept in a separate facility to prevent them from catching fires. Most of them favored a separate facility for storing the chemicals required in the hospitals, especially oxygen cylinders. This also highlights that healthcare workers understand that many fires can be avoided if chemicals are kept separately where a minimum number of people are present. There are many studies that state that this can reduce the chances of fire accidents in hospitals. A study by Majd et al. (2020) provides evidence of the credibility of these findings obtained in this study. The researchers state that chemicals pose a significant risk of fires in healthcare settings. According to them, every hospital should have a disaster preparedness plan established and there should be a distinct section of disasters through chemicals. They further highlight that the plan should have three main categories: hospital preparedness, chemical incidents and response to disasters through chemicals. This proves that chemicals pose a

serious threat of fire accidents. Further, a study by Choudhary et al. (2020) demonstrated that chemical fire accidents have become very common these days as seen from the high amount of fire accidents during COVID-19. The hospitals should have staff trained to avoid and handle such accidents. The staff should have the knowledge of the chemicals used in healthcare settings that could initiate fire accidents such as oxygen cylinders, so that they can be mindful to keep them separately from the mainstream patents and visitor area and in case they are being used, their proper functionality must be ensured so that false functioning can be detected and any disaster can be avoided. Mondal et al (2020) also contribute to this by stating that the assessments of chemical fire accidents must be done through various evaluations available such as the Fire and Explosion Index, Dow Chemical Index, etc.

Further, in case of fires in the hospital premises, it is important to have emergency routes or exits which can help in quick evacuation of the hospitals and minimum loss of lives. The findings obtained in this study point toward the awareness of healthcare professionals that it is important to have emergency exits for emergency evacuation in the hospital premises. These findings are supported by many studies. According to Sahebi et al. (2021), in order to achieve a robust level of hospital preparedness. It is important to have exit plans and routes for quick evacuation. Further, they also highlight that during a hospital evaluation process, the safety of patients and the maintenance of their health are of primary concern. Hence, along with the affirmation of the emergency eye, it is important that there are emergency exit drills so that the staff can quickly understand their roles in case of emergency eviction and all the people including the patient, staff, and visitors can evacuate the hospital premises in time.

The use of technology is increasing in fire safety and risk assessment and hospitals and healthcare workers are recognizing its utility. The findings of this study highlight the fact that the majority of healthcare professionals are aware of the use of technology in fire safety. Sanni-Anibire et al. (2020), state in their study that technology in fire safety and risk assessment is effective for early detection of possibility of fires through the analysis of various factors such as temperature, smoke and gas level in the environment. In addition, they also state that various advanced technologies such as the Internet of Things are effective in the real-time analysis and collection of data of fire hazards. Another study by D'Orazio et al. (2020), states that technology enables the various stakeholders involved in the fire safety and risk assessments. to effectively communicate with each other. Technology increases communication and coordination to improve fire safety and the construction of buildings. Jamil et al. (2020), provide utility of the Internet of Things in the detection of fires through IoT-enabled smoke detection, which can automatically prevent fires through the activation of fire suppression systems and other electrical equipment while providing emergency fire alerts to all the people in the hospitals. Sharma et al. (2020), state that the Internet of Things reduces the time taken to detect the possibility of fires as compared to manual risk assessments. The storage of all the data in the cloud increases the access to all the authorized personnel which increases the transparency and accountability of healthcare organizations. It also enables the optimum use of all the resources available for fire safety and risk assessments. However, a study by Rashid et al. (2023), provides the limitation of the use of technology. According to researchers, advanced technologies such as the Internet of Things have a high cost for the installation and maintenance of fire safety technology. The researchers state that these technologies are very expensive and cannot be afforded by all hospitals. Other technological equipment in fire safety such as automatic sprinkler systems are majorly

expensive and have high overhead costs. He et al. (2023), also provide evidence that these technologically advanced systems are complex and require a high level of expertise and training for their functioning and maintenance. Yesmin et al. (2022), state that these technology-based equipment are prone to malfunction and disruptions and lower productivity.

Three technological instruments are also prone to cyber-attacks. Further, the findings were obtained from the questions regarding the knowledge of healthcare workers on various components of fire safety and risk assessments. According to the findings obtained, it is found that fire hazards are the major components of fire risk assessments. The risk assessments must evaluate all the points and areas that act as fire hazards in the hospitals. Kelly et al. (2021), state that hospitals should have comprehensive fire risk assessments so that all the fire hazards could be identified in a robust manner. The fire risk assessments should maintain a safety checklist where all the safe components and those which are unsafe must be listed so that they could be identified in time of fire incidents. Further, some of the participants also said that budgets are the most important component of fire risk assessment. This is also supported by some studies, such as Azarmi et al. (2022), which state that budget forms an important requirement for the installation of modern equipment for risk assessments and employing experts who could identify all the areas that could lead to fire accidents. Another study by Lestari et al. (2022), also states that the budget should be prioritized in fire safety management so that disaster preparedness can be increased. Some of the participants also highlighted that emergency exits form a major component of fire safety risk assessments. According to them, the presence of emergency exit ways should be evaluated to ensure that there are enough exits to evacuate the people present in the hospitals without any casualties. Some studies are also in favor of this, such as those by Bayat et al. (2020), which provide the

importance of emergency exits for the seamless and casualty-free evacuation of patients, visitors, and staff during fire accidents.

Further, the findings provide evidence of the preferred number of times fire safety risk assessment should take place according to the healthcare workers involved in the study. The results found that a majority of these participants were in favor of risk assessments being conducted annually and some said, it should be biannually. Some participants also said it should be once every two years. The empirical evidence of the number of times risk assessments should be carried out can be provided through many studies. A study by Sunindijo et al. (2020), found out through their quantitative assessment that fire assessments are successful when done once every year. The authors found that comprehensive fire assessment must take place in a timely manner. However, a biannual assessment will require substantial financial prowess and many essential resources which could hamper the distribution of monetary resources in other areas in the hospitals. Hence, they concluded that an annual fire risk assessment will provide the essential knowledge and safety guidelines to prevent fire in hospitals. Another study by Grimaz et al. (2021), states that when any construction or structural modification takes place in the hospital fire assessment should take place. This is because these constructions and modifications can increase the chances of fire hazards in the hospitals.

The findings provided the population which is at the most risk of fire accidents in hospitals. The participants concluded that disabled patients and visitors are at the highest risk during fire accidents in hospitals. This is since disabled patients cannot move promptly to save themselves in case of fire accidents. The visitors, on the other hand, do not possess knowledge of the emergency exits in the hospitals and may find it difficult to evacuate the hospital premises during fire accidents. The participants also said that after

patients and visitors, the staff is at the maximum risk. These findings are supported by many studies. Egodage et al. (2020), state that disabled people are highly vulnerable during fire accidents. It is difficult to evacuate them during a fire accident. The critically ill patients and those on life support also form a population which is at risk during fire accidents due to the lack of facilities for their evacuation. Suhaili et al. (2020), state that the disabled and critically ill patients are at the highest risk as they are unable to self-evacuate during critical fire accidents. The study by Barten et al. (2021), states that hospitals should maintain a log of visitors entering the hospital. This is required so that during fire accidents, it can be ensured that all the visitors are safely evacuated from the hospital.

Further, the findings also provided evidence of the areas where the maximum measures of fire safety must be present, These attributed to the areas which are at the maximum risk of fire. The findings suggest that patient rooms are the areas that should have the maximum fire safety measures. This is because these are also the areas that are at the highest risk of fire accidents. The patient's room contains many electronic devices which cause fire accidents. In addition, chemicals and gasses such as oxygen cylinders are present in these rooms. These can catch fires and cause major accidents. Various studies provide evidence in support of these findings. Capolongo et al., (2020) study states that all patient rooms must have specialized facilities for safeguarding against fire hazards, especially chemicals and glasses. Another study by Che Huei et al. (2020), also states that there are many fire hazards in the patient rooms including many electrical equipment, various chemicals and oxygen cylinders which pose a serious threat to the patient's life and increase the chances of fire accidents. In such a case, it is vital to have fire safety hazards in the patient rooms. There are many ways through which fire safety training is being integrated into the routines of healthcare providers. The healthcare workers were

enquired about the most preferred way to integrate fire safety training. According to the findings obtained in the study, the maximum number of participants responded that the fire safety training for healthcare workers could be integrated practically by conducting regular fire drills. Some of the participants also were in favor of conducting monthly meetings, and fire safety training could be integrated practically. Annual meetings and fire safety classes were also the preferred method of providing fire safety training to healthcare professionals. According to the study conducted by Menzemer et al. (2024), regular fire drills are crucial for the knowledge and awareness of the staff, and healthcare workers so that they can be trained optimally in the evacuation process of the patients and their peers and colleagues. Truong et al. (2022) also state that fire drills provide healthcare workers practical experience and skills to deal with fire accidents, which is crucial in case of fire accidents. Jaafar et al. (2023), state that in the UK, many hospital accreditation organizations including NHS consider whether the hospitals are engaged in fire safety education and training. These are considered a crucial measure to obtain higher grading among the hospitals. Casey et al. (2021), monthly safety training is considered a crucial tool for educating healthcare workers for integrated safety training which helps in providing comprehensive education about all the fire hazards in the hospital, ways to mitigate these fire hazards, and steps to be taken in the fire accidents such as communicating with all the peers and safe evacuation of patients, visitors and staff. Another study by Duryan et al. (2020) states that conducting fire safety meetings is important for effective knowledge transfer and can be integrated into the safety, health, and environment meetings for better mitigation of the issue of fire hazards and better planning of evacuation plans. On the contrary, a study by Iflaifel et al. (2020), provides evidence that conducting annual meetings is better to educate healthcare workers about fire safety measures. According to the World Health Organization (2020), the operational

framework for primary healthcare centers should also have an annual meeting to educate healthcare workers on the proper safety measures in healthcare settings including fire safety measures. Lastly, the findings found that fire-resistant materials are the most effective in reducing the chances of fire accidents and the extent of damage caused by them. This result is supported by Altaie et al. (2023), who provided evidence that fire-resistant materials can effectively prevent fire accidents through their study. Further, they also prove that regular timely revision of these materials can reduce the risk of fire and prevent any human casualties. These materials are also used in the fire safety plans. Ilić et al. (2021), state that these materials provide passive protection to keep the fire compartmentalized in a specific place and prevent the spread of fire. This allows the people to evacuate the place reducing the risks of casualties. Further, Mullins-Jaime, and Smith, (2022), in their study state that fire-resistant material increases the level of protection from fires and improves the safety of life. Irwanto et al. (2023), through their studies, state that these fire-resistant materials can be installed on walls, floors, ceilings, doors, etc. Through these, it creates protective compartments to help prevent the spread of fires. However, there are many limitations of fire-resistant material that should be considered before use in healthcare settings. There are various kinds of fire-resistant materials in the markets. Many of them are Fire-resistant Materials that can be sprayed on multiple surfaces. Still, their limitation lies in their potential to release toxic substances that can harm the health of people (Kim et al. 2021). The surface-coated fire-resistant material, although having proper functionality, hampers the aesthetics of the place. In addition to that, there are many cheaper and low-quality varieties available that pose risks to human health, property and the environment (Mohd Sabee et al. 2022). The fire-resistant panels are also installed to enhance the safety of hospitals but these are considerably higher costs which limits their usability (Van Coile et al. 2023). In addition

to this, there are other dangers associated with fire-resistant materials. The poor quality of fire-resistant material often leads to a higher spread of fires. The low quality of fire-resistant material burns to produce black smoke which can cause air pollution, pose a high amount of risks to the human, and even hamper evacuation (Nayeb, and Aydıntan, 2022). These materials also do not meet the criteria set by the government and hence can pose legal and policy-related issues for the hospitals. With the above data, it has been examined that hypothesis are found to be true. Through the identification and mitigation of potential hazards, the safety and welfare of patients are substantially ensured. Also, Identifying, evaluating, and implementing risk controls are prevalent in health care would even consider to be true.

5.2 Implications of Fire Safety and Risk Assessment for Government in the UK

The number of fire accidents has increased in recent years. This increase was especially during the COVID-19 pandemic due to the increase in the number of oxygen cylinders used by the patients. As a result of this, the government of the UK has created and revised several laws and policies related to fire safety and risk assessment post-pandemic. The most implemented law by the government and adopted by a majority of buildings including healthcare organizations is the Fire Safety (England) Regulations 2022 which came into effect on 23 January 2023 (Murphy, and Lakoma, 2023). There are a number of implications of fire safety and risk assessment on the government. These are the allocation of responsibilities in a building that is occupied by many people. These include both residential buildings and healthcare organizations. The government mandates specific responsibilities to the owners of the buildings, managers of the healthcare organization or designated responsible persons who will be responsible for driving the

whole process of evacuation in the event of fire accidents (Sarvari et al. 2024). Regular fire risk assessments and creating awareness among the staff and building residents are the responsibility of these people. This is done to ensure that accountability is maintained and compliance and regulations are followed. The government also created many laws and regulations for the regular inspection of the external wall systems in these buildings (Arewa et al. 2021). This is because these are also a major cause of fire accidents. Timely inspections are carried out for the maintenance and mitigation of risks and hazards. The government also formulated many policies for the robust evaluations of fire hazards and creating strategies for addressing these risks (Law, and Hadden, 2020). The proper communication between and across various channels is also done by the government. They ensure that the people are well-informed and well-educated regarding various safety norms and measures. The communication between stakeholders related to fire safety should be transparent and provide all the knowledge, facts, and data regarding various strategies for fire safety, the process of evacuation, and the proper use of fire equipment to ensure that the residents and staff also have a robust knowledge of fire safety processes.

The other implication includes the need to impose penalties in case of non-compliance with the law and policy regulations. In some cases, there can also be criminal charges against the building owner or the healthcare organization if proper fire safety procedures are not followed (Kincaid, 2022). These regulations post towards the creation of better fire safety standards in the UK for the healthcare organizations engaged in various levels of care - primary, secondary, or tertiary level of care. All these regulations lay a greater emphasis on the stakeholder's participation in fire safety. These regulations and laws are not just legal compliance but also have a moral and ethical responsibility toward the safety of people's lives. However, compliance with the laws is not an easy task. It requires a high level of coordination, collaboration, and communication among all the people

involved in the fire safety processes. Hence, this can fulfil the hypothesis that is Through the identification and mitigation of potential hazards, the safety and welfare of patients are substantially ensured. Identifying, evaluating, and implementing risk controls are prevalent in health care.

5.3 Implications of Fire Safety and Risk Assessments on Healthcare Organizations

There are various implications of fire safety and risk assessments of healthcare organizations. These are related to the non-compliance of fire safety regulations, compliances, and failure to conduct timely audits for risk assessments. The events of fire accidents in healthcare organizations whether, primary, secondary or tertiary care can cause severe risks to the health and safety of patients especially those who are critically ill, disabled, or on life support (McFadden et al. 2021). The visitors and staff are also at high risk. In such cases, it is crucial that healthcare organizations comply with the fire safety standards and laws implemented by the government. Conducting regular audits is essential to ensure the safety of life and property in the hospitals. This involves the identification of fire hazards and various steps to mitigate the risks and dangers so the risk of fire can be reduced and mitigated (Elbeddini et al. 2021). The hospitals can also comply with regulatory standards and or the ones set up by local authorities. Compliance with the fire safety standards, laws and policies set up by the government is essential to identify and understand various measures to mitigate fire hazards such as gasses, chemicals, and electrical wirings and equipment in the patient rooms (Cushley et al. 2021). The hospitals have to conduct a timely audit to identify gaps in the fire safety measures and make the required adjustments. These audits also help the hospitals to improve existing systems such as emergency care. These audits enable the hospital to

implement improvements in the evacuation plans, communication systems in the hospitals especially in the stakeholders involved in the evacuation process, and training of the staff in the hospitals (Auramen et al. 2020). The hospital should take care of the fire safety procedures which also have an impact on overall patient care as these processes should include the principle of continuity of care.

The hospitals should have robust maintenance programs in place to cater to the electrical wirings in the hospitals usually in the patient rooms so that any gaps can be identified and the risk of fire can be reduced (English et al. 2021). Hospitals should have policies and rules regarding the storage of flammable chemicals away from the patient and contact with unauthorized personnel (Lim et al. 2021). They should also be kept away from any sources of ignition in compliance with the regulations. The various doors, entrances, and exits must be inspected and maintained timely to make sure they are functional and not obstructed. The HVAC systems in the hospitals must also be timely maintained and evaluated so that they do not pose any risks of fire accidents (Sachdeva Jr et al. 2022). The smoking policies should be strictly followed. The area for smoking should be separately designated with proper ventilation and fire-resistant materials.

5.4 Implication of Fire Safety and Risk Assessments on Healthcare Workers

The medical facilities in hospitals must be fully equipped with the risk assessment procedures and the healthcare workers must take an active participation. This is necessary to understand how different materials and substances pose a risk of fire safety. These substances and materials are medical supplies, oxygen cylinders, and other electrical equipment which pose a risk for fire and threat to the safety of life and property in the hospitals (Sahoo et al. 2024). The risk assessment involves the identification of faulty

equipment, wires, and flammable chemicals in the laboratories (AlShammari et al. 2021). In addition to this, healthcare workers must be trained in fire safety procedures through meetings, classes, and fire drills. This is essential for the formulation of strategies for evacuation in hospitals. These evacuation strategies must be patient-centered to make sure that the critically ill, injured, and disabled patients are evacuated first (Wu et al. 2024). The individual needs of the patients in accordance to the ailments of the patient so as to continuously maintain the care provided to them should be done. Fire safety education and training must be given through regular fire drills and simulations. The simulations are done to mimic the real-life scenarios and make sure the staff has the evacuation plan practiced before so that they can identify their individual roles in a realistic environment (Lawson et al. 2020). The healthcare workers should be made aware and educated about the guidelines for fire safety from the emergency responses to the evacuation processes and plan. The staff should also be provided training of the various procedures and processes involved in the risk assessments. Moreover, healthcare workers must be trained in a way that they acquire the required tips for the prevention of fires through comprehensive and smart prevention methods. To ensure this, the healthcare workers must be given hands-on training on the use of fire extinguishers, evaluation processes for various kinds of patients, communication procedures in a state of emergency, etc. (Dichari, 2021). Timely simulation exercises and drills must be emergency-ready and confident to tackle complex situations to prevent fires and maintain the safety of packets, visitors, and staff on the hospital premises (O'donovan, and Mcauliffe, 2020).

CHAPTER 6: CONCLUSION

Background of the chapter

This chapter consists of concluding statements of this dissertation which conclude the findings obtained in this study. In addition to the recommendations to increase the efficiency of fire safety protocols and risk assessments in healthcare settings in the UK, The strengths, limitations, and future scope of the study will also be included in this chapter.

6.1 Concluding Statements

Fire Safety and Risk Assessments are a crucial component of safety processes in the healthcare sector in the UK. The healthcare sector is greatly endangered by the risks of fire accidents which threaten the safety of the patients, healthcare staff, and visitors. This is because of the large number of factors contributing to fire accidents present in the hospitals. Many of these risk factors such as chemicals, electrical equipment and wirings, oxygen cylinders, etc. pose risks to patient safety. Hence, healthcare workers need to be educated and have an awareness of various factors that pose this risk. Understanding this is crucial as the individuals who are sufficiently aware of the fire safety problem will perform their best in the event of fire accidents to improve their and others' safety. The findings of this study provide evidence that healthcare professionals in the UK healthcare sector have developed a robust awareness and understanding of fire safety and this enables the healthcare professionals to adopt a proactive and risk-driven approach for risk assessment and fire safety. Moreover, the healthcare providers realized the need for fire safety drills in the healthcare organizations and would willingly participate wherever they were given an opportunity. Healthcare settings must have automatic fire alarms as an

important fire safety management equipment. Fire safety risks are reduced to a significant level when the fire alarms, along with other equipment such as automatic sprinkler systems, water hydrant systems etc. are used for the mitigation of fires as part of the fire prevention in healthcare settings. Flammable and combustible chemicals should be kept in a separate facility to prevent them from catching fires. Healthcare workers understand that many fires can be avoided if chemicals are kept separately where a minimum number of people are present. The staff should have the knowledge of the chemicals used in healthcare settings that could initiate fire accidents such as oxygen cylinders so that they can be mindful to keep them separately from the mainstream patents and visitor area and in case they are being used, their proper functionality must be ensured so that false functioning can be detected and any disaster can be avoided. The hospitals should have robust maintenance programs in place to cater to the electrical wirings in the hospitals usually in the patient rooms so that any gaps can be identified and the risk of fire can be reduced. Another important fire accident mitigation plan is the formation of robust routes of exits in the hospitals. It is important to have emergency exits for emergency evacuation in the hospital premises to achieve a robust level of hospital preparedness. It is important that there are emergency exit drills so that the staff can quickly understand their roles in case of emergency eviction and all the people including the patient, staff, and visitors can evacuate the hospital premises in time. During the evacuation process, the most important is to ensure that the evacuation process suits the needs of the patients especially those who are not mobile, disabled, critically ill or on life support. The individual needs of the patients in accordance to the ailments of the patient so as to continuously maintain the care provided to them.

The need for integrating technology in fire safety and risk assessment is also growing. Most healthcare professionals are aware of the use of technology in fire safety.

Technology in fire safety and risk assessment is effective for early detection of the possibility of fires through the analysis of various factors such as temperature, smoke, and gas levels in the environment. In addition to this, there are novel and highly advanced technologies such as the Internet of Things and Predictive analytics which can predict the possibility of fire accidents through the hazards obtained in the risk assessments. Technology increases communication and coordination to improve fire safety and the construction of buildings. These advanced technologies such as the Internet of Things reduce the time taken to detect the possibility of fires as compared to manual risk assessments. To achieve a comprehensive future risk assessment budgets play a major role. Budgets should be prioritized in fire safety management so that disaster preparedness can be increased. But, fire hazards are the most important in a fire safety risk assessment. The fire risk assessments should maintain a safety checklist where all the safe components and those that are unsafe must be listed so that they can be identified in times of fire incidents.

In addition, fire risk assessments must be conducted annually to educate and inform the healthcare professionals and other staff working in the hospital. In case, any construction or structural modification takes place in the hospital, a fire assessment should take place. The hospitals should include fire-resistant materials to reduce the risk of fire and prevent any human casualties. These materials provide passive protection to keep the fire compartmentalized in a specific place and prevent the spread of fire. All these findings obtained in this study provide various implications for policymakers, healthcare organizations, and health workers. The healthcare workers must be trained in a way that they acquire the required tips for the prevention of fires through comprehensive and smart prevention methods.

6.2 Recommendations to increase the efficiency of fire safety protocols and risk assessments in healthcare settings in the UK

To improve the process of fire safety and risk assessment in healthcare settings, there are various recommendations which can be used. Stricter regulations must be formulated and implemented for the healthcare setting. Regular audits of the healthcare centers must be done to evaluate fire hazards, evaluate fire safety processes, and fire safety materials being used in the hospitals for the prevention of fires. Regular risk assessment should be done every year and whenever any important structural modification occurs in the hospitals. This is because these modifications may create gaps in the fire safety processes, so it is important to identify these gaps. A robust plan for escape in severe fire accidents must be formulated and all the staff must be practiced enough to know the exit routes and their roles in such a situation. All the places in the hospitals must have fire alarms and tiger fire safety devices such as sprinkler systems installed. These devices must be assessed for their proper functioning on a monthly level and their batteries must be changed regularly to make sure they are functioning properly at all times. All the areas where combustible materials are kept including chemicals and gasses should be isolated and fully equipped with fire resistant materials in the doors and walls so that it can be excluded in case of fire accidents. Fire extinguishers and fire detection could be kept in all the areas in the hospitals to avoid fires. All the fire safety assessments must be properly documented and reviewed.

6.3 Strengths of the Study

The study comprehensively explores fire safety and risk assessments through primary research and quantitative assessments. The research in the study has been conducted through a survey which strategically contains questions that test the awareness and knowledge of the healthcare professionals on the study topic. The participants in the study are healthcare professionals and people who are closely related to healthcare. This is done to ensure that the people have real life insights and knowledge about the application of fire safety in healthcare settings. The survey conducted in this study was conducted through social media channels which made it easier and less time-consuming, The quantitative analysis of the data obtained was done through SPSS which provided a robust data analysis for each variable in the study. Later the obtained results were critically discussed in reference to other studies to establish the credibility and validity of the findings. The number of participants included in this study are more than 100 which provides substantial credibility and reliability to the findings. The implications of fire safety and risk assessment and recommendations to improve its efficiency is also included in the study.

6.4 Limitations of the study

The study was majorly focused on the UK and all the components have the findings and results related to the UK which limits its generalizability to other regions. The responses obtained in the survey may have bias as they are limited to the knowledge of the participants and their individual situation and exposure.

6.5 Future scope of research

The future scope in this area can be done to understand and evaluate diverse methodologies of risk assessments to understand which have the maximum efficiency. This can also be done in different healthcare settings such as primary, secondary, tertiary healthcare settings to understand which methodology works the best in which healthcare organization. Further research can also be done to formulate high efficiency patient centered evacuation plans.

Scientists should conduct more research on fire resistant materials which can be used in fire safety in hospitals. The focus of this research should be to estimate the limitations of the materials currently available and to process a material that is robust and suitable to a number of different areas and settings. The fire-resistant materials which are suitable for the environment and must be created.

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APPENDICES

Appendix 1: Risk assessments

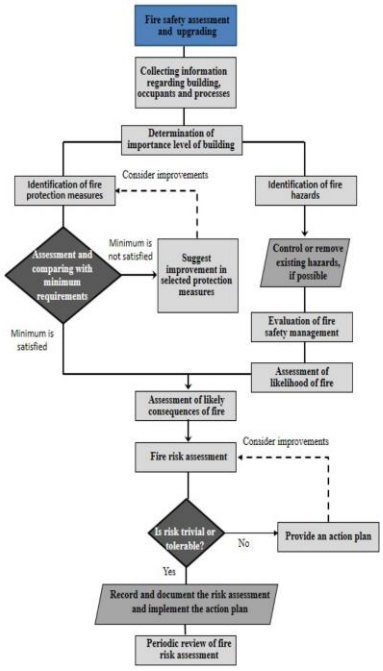

Figure 2:Fire safety risk assessment framework

Source: (Bakhtiyari et al., 2022).

Appendix 2: Raw data